



INNOVATION IN PUBLIC TRANSPORTATION

Fiscal Year 1978

U.S. DEPARTMENT OF TRANSPORTATION
Urban Mass Transportation Administration



**A DIRECTORY
of RESEARCH, DEVELOPMENT
and DEMONSTRATION PROJECTS**

INNOVATION

IN PUBLIC TRANSPORTATION



Fiscal Year 1978

**U.S. Department of Transportation
Urban Mass Transportation Administration
Washington, D.C. 20590**

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Introduction

This annual directory contains descriptions of current research, development and demonstration (RD&D) projects sponsored and funded by the U.S. Department of Transportation's Urban Mass Transportation Administration (UMTA). One of UMTA's major objectives is to make public information regarding its RD&D activities readily available, and this publication is one of the principle vehicles for reporting such information.

This directory focuses on activity that took place in fiscal year 1978, which began on October 1, 1977 and ended September 30, 1978. All of the projects described in this volume are funded under Sections 6, 9, or 11 of the Urban Mass Transportation Act of 1964, as amended.

Section 6 of the Act has authorized the Secretary of Transportation "to undertake research, development and demonstration projects in all phases of urban mass transportation...which he determines will assist in the reduction of urban transportation needs, the improvement of mass transportation service, or the contribution of such service toward meeting total urban transportation needs at minimum costs." The Act also authorizes "the development, testing, and demonstration of new facilities, equipment, techniques, and methods."

In November 1978, Congress passed the Federal Public Transportation Act of 1978, which shifted the responsibilities under Section 9 of the Urban Mass Transportation Act to Section 8.

Under the former Section 9 of the Act, funds are authorized each year to conduct local transportation planning studies, otherwise known as Technical Studies. A

portion of these Technical Studies funds are also used annually for Special Studies to help local planning agencies and UMTA improve the quality of information used for local transportation planning.

Section 11 authorizes a program of University Research and Training Grants. These grants are designed to contribute to UMTA's research and to stimulate professional growth in fields relating to transportation. Summaries of the Special Studies and the University Research and Training Grant projects appear in Chapter 16 of this report, along with listings of available publications.

UMTA's organizational structure is illustrated on the preceding page. The offices responsible for administering research, development and demonstrations are shaded. The projects described in Section One of this document are administered by the six offices listed under the Office of Technology Development and Deployment. The projects described in Section Two are administered by the Office of Service Methods and Demonstrations. The Offices of Planning Assistance, Planning Methods and Support, and Transportation Management are responsible for the projects included in Section Three, and the projects described in Section Four are administered by the offices listed under Policy and Program Development.

Table 1 shows funding for major RD&D program areas. Charts summarizing funding and other important information about individual UMTA projects follow the descriptive material in each chapter.

In these project summary charts, dates are listed for each project indicating the time at which the project was approved

by UMTA to the expected completion date. Except where otherwise indicated, dollar amounts presented for each project represent federal funds provided by UMTA and do not include funds from other federal, state, local or private sources. Funding figures are provided to give an indication of the scope of individual tasks and, in most cases, these figures are cumulative. Small support tasks and contracts under \$10,000 are not always calculated into the project totals. The figures in this volume, therefore, should not be used for budget analysis.

The project charts also identify other federal organizations which support and complement UMTA's RD&D in the field of urban mass transportation. The Federal Highway Administration (FHWA) funds or performs projects jointly with UMTA, generally in the areas of transportation planning and traffic management. The Federal Railroad Administration (FRA) manages the DOT Transportation Test Center (TTC) at Pueblo, Colo., which includes urban rail test facilities and the rail dynamics laboratory. The Transportation Systems Center (TSC) at Cambridge, Mass., supports UMTA by conducting in-house research, analysis, and development, and by managing related RD&D contracts. TSC is a major component of the DOT Research and Special Programs Administration, and performs technological and socio-economic research in all modes of transportation.

Most of the completed projects included in this 1978 edition have either issued technical documents or are currently preparing reports for publication. These reports are listed in a bibliography

following each chapter and usually may be obtained from the National Technical Information Service (NTIS) of the U.S. Department of Commerce. In addition, UMTA periodically publishes collections of report abstracts. Details on how to obtain these and other technical reports are provided in Appendix A. Forms for ordering publications from NTIS are also included.

Appendix B provides information for potential contractors and grantees on participation in UMTA's RD&D programs, including details on the submission of proposals, proposal evaluation criteria, and university research grants.

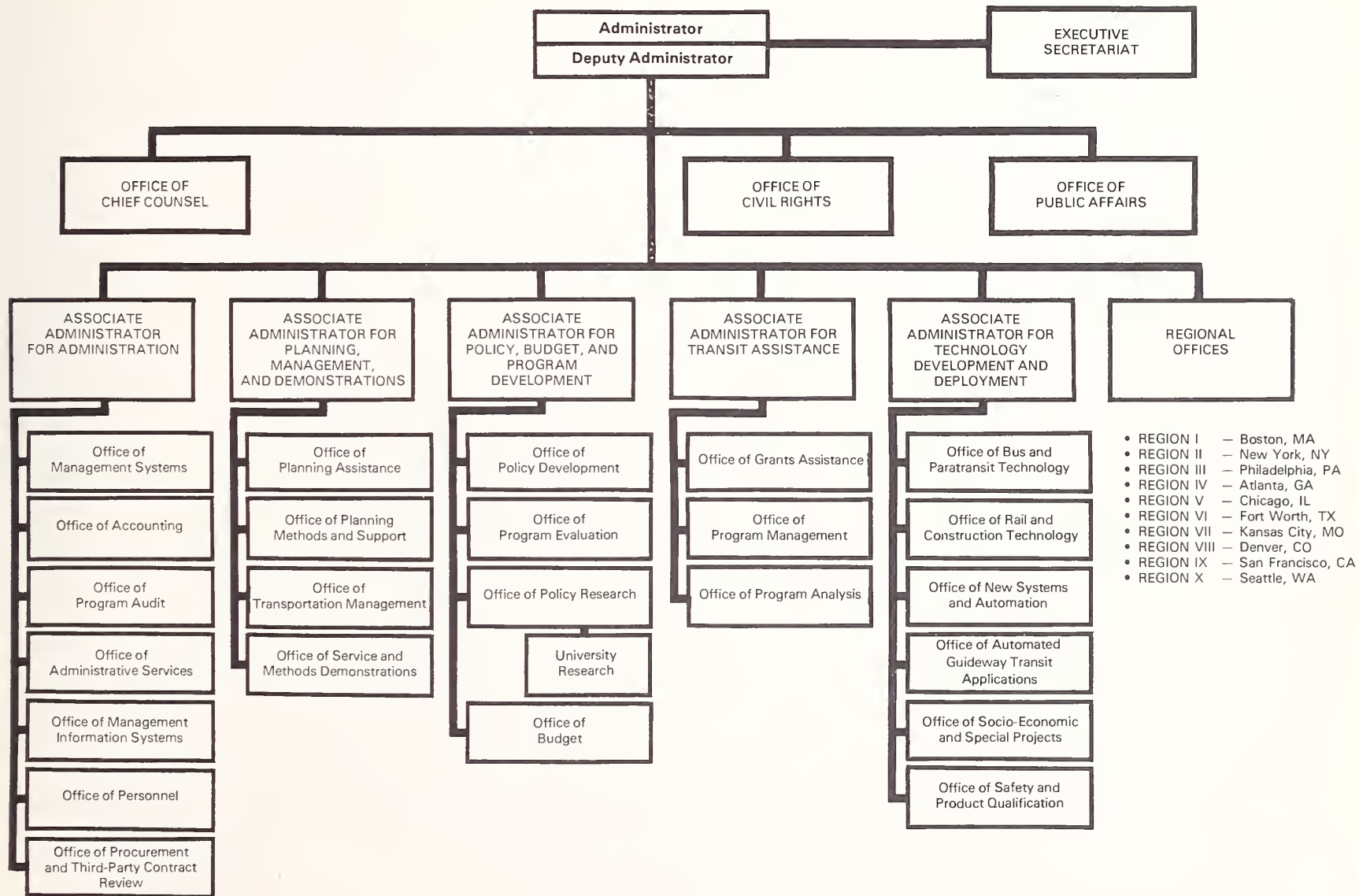
An index of agencies and contractors (excluding the educational institutions performing work for the University and Research Training Grant Program), a project index and a subject index may be found at the end of the directory.

This document was prepared by the Office of Technology Sharing at the U.S. Department of Transportation's Transportation Systems Center in Cambridge, Mass. Copies may be obtained by contacting this office, or ordered directly from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Table 1
Urban Mass Transportation Administration
Summary of RD&D and Related Funding

	FY 1977 And Prior	FY 1978 Actual	FY 1979 Estimates
	(Dollars in thousands)		
Technology Development and Deployment			
Bus and Paratransit Technology	66,630	6,753	10,150
Rail and Construction Technology	129,995	13,771	12,900
New Systems	148,780	19,483	12,830
Safety and Product Qualification	3,020	1,471	1,700
Systems Studies, Support and Development	12,669	1,124	1,270
National Coop. Transit Research Program	0	1,000	1,000
Subtotal	\$361,094	\$43,602	\$39,850
Service and Methods Demonstrations	79,000	15,500	15,500
Planning Methods and Support	13,025	3,250	3,200
Special Studies (Section 9 Funds)	12,420	3,000	3,000
Transit Management Techniques and Methods	16,381	3,000	3,250
Policy and Program Development	6,700	2,044	2,200
University Research (Section 11 Funds)	<u>20,335</u>	<u>1,995</u>	<u>2,000</u>
Total	\$508,955	\$72,391	\$69,000

TABLE OF ORGANIZATION URBAN MASS TRANSPORTATION ADMINISTRATION



SECTION ONE
Technology Development
and Deployment



Technology Development and Deployment

The following seven chapters are devoted to projects which are administered by the Office of Technology Development and Deployment. In exploring and testing new transportation technologies, the office has attempted to adhere to the following three objectives.

In conventional bus and rail transit design, equipment manufacture, or construction, the office has attempted to obtain either a substantial reduction in life-cycle costs without sacrificing performance, safety, or service capability; or substantial improvements in safety, performance and service capability achieved in a cost-effective manner.

As a second objective, a special effort has been made to support selected, high-risk, high-technology research and development initiatives which could potentially result in significant increase of productivity of transit operations, such as through the introduction of automation.

Finally, a strong effort has been made to support national priorities, such as energy conservation, central city revitalization, transit accessibility for the elderly and handicapped, safety and environmental protection.

In order to meet its objectives, the Technology Development and Deployment Office sponsors research, development, testing, evaluation and demonstrations of selected new technologies to prepare for their deployment in actual transit service.

In addition, the office participates actively in developing and reviewing equipment specifications, in promoting standardization of transit vehicles and equipment, and in qualification of new and improved transit products. UMTA conducts evaluations and assessments of existing technology, publishes state-of-the-art summaries, and cooperates with agencies such as the Environmental Protection Agency, the Department of Energy, and the National Bureau of Standards in carrying out programs of national importance.

UMTA's delivery system for new or improved transit technologies depends, ultimately, on the purchase of new products with UMTA capital grant assistance. The fundamental strategy for improving the deployment process for new transit technology is to coordinate the efforts of UMTA's Office of Technology Development and Deployment with its Office of Transit Assistance in such a way

as to foster the timely introduction of proven new products, and to conduct the field demonstrations in revenue service which are necessary to prove them.

The need for technical information among client groups is met by UMTA through conferences, seminars, workshops, technical papers, project reports and special reports targeted at particular groups of users. The needs of client groups are ascertained, and the results of Technology Development and Deployment efforts are communicated by conferring and cooperating directly with representatives of these groups, including transit operators, transit equipment suppliers and developers, consulting firms, state and local government agencies, public interest groups, universities, foreign governments and foreign industrial firms.

The organization of the Office of Technology Development and Deployment is shown below. The projects described in this section are funded and administered through the program offices.

Office of Technology
Development and
Deployment
Associate Administrator
George J. Pastor

Office of Bus and
Paratransit Technology
Wilhelm Raitzel
Acting Director

Office of Rail and
Construction Technology
Stephen S. Teel
Acting Director

Office of New Systems
and Automation
Charles Broxmeyer
Director

Office of Automated
Guideway Transit
Applications
Steven Barsony
Director

Office of Socio-Economic
and Special Projects
Ross W. Adams
Director

Office of Safety and
Product Qualification
William J. Rhine
Director



It is easy to transfer from the fixed-route transit buses to the paratransit service offered in Rochester, N.Y.

Bus and Paratransit Vehicle Technology

Trends and Highlights

One of UMTA's major challenges is to stimulate the development of new technologies for buses and paratransit vehicles in order to promote more efficient use of energy, accommodate environmental concerns, and respond to the needs of the elderly and handicapped for access to public transportation. Such technological development is a long-term process, and results cannot always be reported annually.

Of the three major issues—energy, the environment, and access—this last concern for the mobility of everyone commanded a great deal of attention in FY 78. Compliance with the Transbus mandate requiring that all full-sized buses purchased with federal assistance after September 30, 1979 include a maximum 22-inch floor height, a 4-inch kneeling feature, and an access ramp, is being encouraged. A consortium of operators from three major cities—Los Angeles, Miami and Philadelphia—advertised for bids in January, 1979 for the purchase of 530 buses with these specifications. Because no bids for this procurement were received, a review of the Transbus program is being conducted.

Previously developed prototype paratransit vehicles have been exhibited at meetings of operators, at auto shows and in other appropriate settings throughout the year. There is a continuing need to develop smaller, multi-purpose paratransit vehicles, accessible to the elderly and handicapped, but which also serve with flexibility the needs of particular segments of rural, suburban and urban populations. UMTA will continue to assist in the development of such vehicles.



In an effort to comply with Section 504 of the Rehabilitation Act of 1973, the Department of Transportation issued a Notice of Proposed Rulemaking. The proposed regulations, which mandate phased-in accessibility for all DOT-funded facilities and vehicles, were presented in a series of public hearings during FY 78, and the Final Rule will be issued in FY 79. When adopted, the specific regulations contained in the Final Rule will crucially affect bus and paratransit technological development.

Bus Development

General Bus Procurement Specifications (MD-06-0082) have been developed for the Advanced Design Bus and the Transbus. These include standardized terms and conditions, warranty and quality assurance requirements, in addition to the technical specifications. These documents will be revised from time to time. The current version is available from UMTA to any transit property or manufacturer needing them.

In a related project, Transbus Ramp Mockup (MD-06-0024), a full-scale, accurately dimensioned mockup of a typical Transbus front entrance with an access ramp was constructed. The mockup incorporated provisions for height adjustment, ramp slope and different surface characteristics. Volunteers with varying types of physical handicaps tested the mockup to determine the problems of boarding, and maneuvering and securing wheelchairs. The types of hand assists needed by blind persons as well as others with ambulatory disabilities were studied. The mockup is available to manufacturers



Wheelchair lifts are a convenience not only to people confined to wheelchairs but also to those who have difficulty walking.

and operators to use in evaluating various design features.

Another project which has continued since FY 77 is the comparison of procurement methods for full-size transit buses based upon 1) an operator's actual operating cost data, and 2) life-cycle costing methods (Bus Life-Cycle Procurement, VA-06-0045). Specific bus designs are compared in relation to these two cost data methods. The work is being conducted parallel to, but independently of, actual bus procurements under UMTA's capital assistance program. Three different bus procurements have been used, and a simulated life-cycle costing has been compared with actual procurement experience. The objective is to develop acceptable procedures using life-cycle costing upon which actual procurement can be based.



The previously funded study, Impact of Fare Collection on Bus Design (IT-06-0132), has been completed, and a report will be available in 1979. The report will not only review the effect of several alternative methods of fare collection on bus design, but also will assess the actual cost of in-bus fare collection, and alternative methods.

In a Wheelchair Access Evaluation project (CA-06-0103), contracts have been awarded for the installation of four different configurations of passive lifts in existing transit buses, in an effort to develop information upon which transit properties can base planning, purchasing, and retrofitting of wheelchair lifts. This ongoing project includes three front door models, one rear door model, and also will investigate the feasibility of installing a passive lift in the front entrance of the General Motors RTS-II.

Paratransit Vehicle Development

The objective of a new program, Paratransit Vehicle Prototype Procurement (IT-06-0204), is to stimulate the development of vehicles designed to meet the special requirements of certain groups in the population for which present vehicles have only limited suitability. Such vehicles would include regular taxicabs, jitneys, and other vehicles serving the elderly and handicapped, but exclude the conventional "small bus."

Up to three contracts will be awarded in open competition and the work will be

divided into two major tasks. Task I will include the design of the vehicle and construction of a mockup. Task II consists of the manufacture of components and the assembly of three drivable prototypes. These vehicles will then be subjected to testing by an independent contractor to determine their performance characteristics. They will also be evaluated by industry representatives as well as by representatives from the handicapped community. The vehicles developed under this program may be similar to the earlier prototype vehicles, but the contractors will be required to emphasize low initial investment and maintenance costs.



Tests are being conducted on the Transbus ramp mock-up with a simulated curb and a six-inch grade.

Energy Conservation and Environmental Projects

The gas turbine is able to use a variety of fuels other than gasoline or diesel oil, has a low pollution level, and operates smoothly. This last characteristic has many positive side effects in that the reduction of vibration also reduces the need for expensive general maintenance.

This program, and the flywheel energy storage electric propulsion program, are the two major programs being undertaken in the bus propulsion field by the UMTA Office of Technology Development and Deployment (UTD).

A program testing and evaluating a Gas Turbine Bus (DC-06-0204), to be carried out under an interagency agreement with the Department of Energy (DOE), was begun in FY 78. The DOE objective is to evaluate the gas turbine engine in the public environment prior to the selection of either the gas turbine or the Stirling engine as a viable replacement for current gasoline propulsion systems. This decision may be made as early as 1983. UMTA's objective is to evaluate the gas turbine engine in transit operation as a possible replacement of the diesel engine in the short term. The work is divided between the two agencies, and is expected to continue for about seven years.

The second phase of the Flywheel Energy Storage Program (MA-06-0093) is now under way. In Phase I, reported in *Innovation 77*, contractors have developed conceptual designs using state-of-the-art technology and employing a modular design approach in order to establish an

economical production base. Two reports of this work are available (see Bibliography). The second phase of the program will complete the design, and fabrication of engineering prototype hardware, and will test and evaluate these products. Phase II will begin in early FY 79 and is scheduled to be completed in FY 83

Battery-powered buses may become an attractive alternative to conventionally powered buses on certain routes. These buses are clean, quiet, and operate smoothly. There are, however, drawbacks to their extensive use because they lose power relatively quickly, take time to recharge, and are not as cost-effective as conventional vehicles. A study, Project Definition for Battery Bus Evaluation (DC-06-0205), estimating the effort and funding required to use battery buses in shuttle service between DOT buildings in Washington, D.C., was completed, and a final report of this project which describes the number and types of buses, the schedule, the equipment, and facilities and procedures for maintenance and battery charging was published in April, 1978. The report also includes prescribed methodology for monitoring and evaluating the future demonstration.

An actual test of battery bus performance will be conducted when the Roosevelt Island Development Corporation (N.Y.) acquires three battery buses with the help of a capital grant from UMTA. When this grant is approved, a contract for monitoring and evaluating the vehicles will also be awarded in the Battery Bus Test and Evaluation project (IT-06-0206).

The Evaluation of the Diesel Taxi project (MA-06-0066) is continuing, and is expected to be completed in February,



Another ramp design for Transbus features a 35-inch high handrail.

1979, when data comparing diesel and gasoline powered taxicabs within the same fleet over a two-year period, covering some 8,000 hours of running time and 120,000 miles will be available. The interim reports have indicated that the diesels get 50 percent more miles per gallon of fuel than their counterparts, that there is less exhaust emission degradation and that there has been no significant difference in user acceptance. The final report will be available in FY 79.

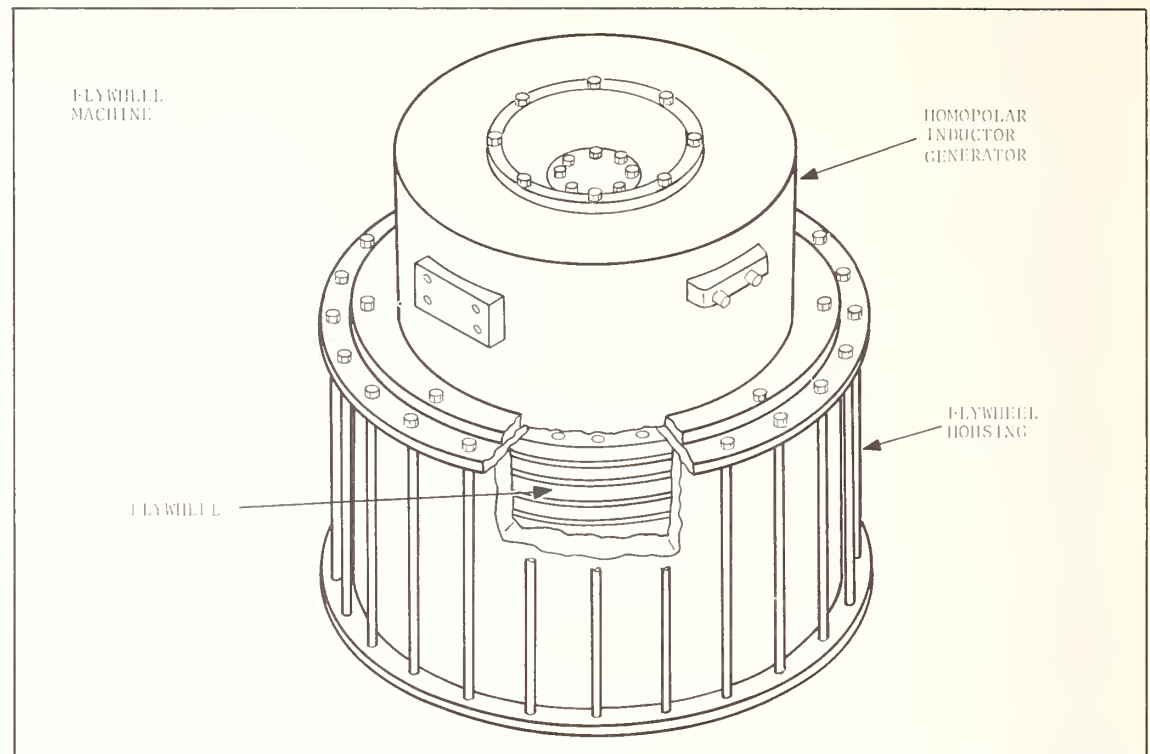
Another project being conducted jointly by the Environmental Protection Agency (EPA), UMTA, and the National Highway Traffic Safety Administration (NHTSA) of DOT, involves Bus Noise Reduction (OR-06-0005). The program intends to demonstrate the effect a well-designed bus noise reduction kit will have on a representative bus configuration.

In September, 1977, EPA issued a Notice of Proposed Rulemaking, setting standards for phased-in reductions in bus

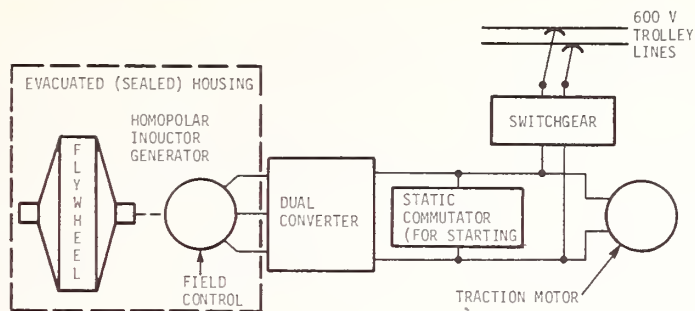
noise levels over a seven-year period. In the metropolitan district of Portland, Ore. considerable research and development is under way in cooperation with EPA.

In the first phase of this program an initial requirements study will be made, and the noise abatement kit will be designed and manufactured, and an engineering evaluation of the kit will be conducted. In FY 78, the program was approved, and detailed discussions were held with the Tri-County Metropolitan Transportation District of Oregon to integrate the bus noise reduction effort with the requirements set forth by the two participating federal agencies.

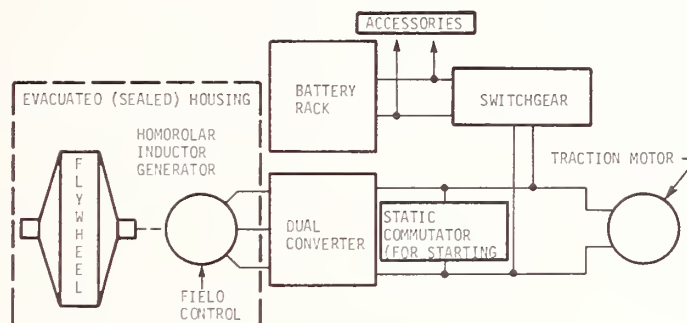
Also in FY 78, a program to improve the reliability of today's bus air conditioning systems was initiated. The main objectives of the program are to improve the reliability and operating efficiency of the systems and reduce maintenance costs. The contractor will be selected in early 1979, and the program is scheduled for completion in FY 81.



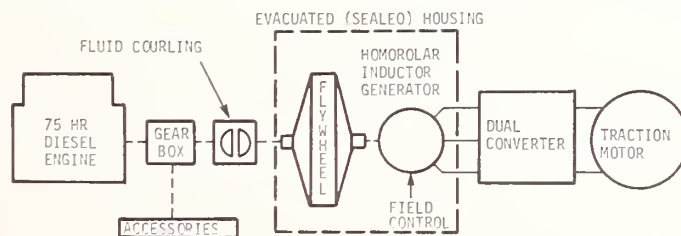
The flywheel housing with a homopolar inductor generator, illustrated here, measures about 36 inches in diameter and is about 41 inches high. The entire assembly, constructed of cast iron, weighs about 5900 pounds.



(A) FLYWHEEL/TROLLEY COACH



(B) FLYWHEEL/BATTERY



(C) FLYWHEEL/DIESEL ENGINE

Three applications of the flywheel energy storage concept are illustrated here.

Bus and Paratransit Vehicle Technology

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
BUS DEVELOPMENT					
General Bus Procurement Specifications	MD-06-0024 MD-06-0082	\$129,000	July 1976- Dec. 1977	Booz, Allen and Hamilton	C.J. Daniels (202) 426-4035
Transbus Ramp Mockup	MD-06-0024	\$175,000	Jan. 1978- Feb. 1979	Booz, Allen and Hamilton	C.J. Daniels (202) 426-4035
Bus Life-Cycle Procurement	VA-06-0045	\$192,384	May 1977- May 1979	Advanced Manage- ment Systems	C. J. Daniels (202) 426-4035
Impact of Fare Collection on Bus Design	IT-06-0132	\$176,000	Sept. 1976- Oct. 1977	Booz, Allen and Hamilton	C. J. Daniels (202) 426-4035
Wheelchair Access Evaluation	CA-06-0103	\$292,000	Feb. 1977- July 1979	Caltrans	C. J. Daniels (202) 426-4035
PARATRANSIT VEHICLE DEVELOPMENT					
Paratransit Vehicle Prototype Procurement	IT-06-0204	\$900,000 (ea.)	July 1979- March 1980	To be selected	John E. Ridgley (202) 426-8483
ENERGY AND THE ENVIRONMENT					
Gas Turbine Urban Bus	DC-06-0204	\$2,800,000 DOT \$11,200,000 DOE	May 1978- Sept. 1985	To be selected	J. F. Campbell (202) 426-4035
Flywheel Energy Storage	MA-06-0093	\$15,000,000	Dec. 1978- June 1981	TSC	J. F. Campbell (202) 426-4035

Bus and Paratransit Vehicle Technology

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
ENERGY AND THE ENVIRONMENT					
Flywheel Energy Storage: Management Systems Evaluation	WI-06-0005	\$15,000	March 1978- June 1978	University of Wisconsin	J. F. Campbell (202) 426-4035
Project Defini- tion for Battery Bus Evaluation	DC-06-0205	\$52,000	Nov. 1977- April 1978	Transportation Assistance, Inc.	John E. Ridgley (202) 426-8483
Battery Bus Test and Evaluation	IT-06-0206	\$200,000 (approx.)	N/A	Roosevelt Island Development Corp.	John E. Ridgley (202) 426-8483
Evaluation of Diesel Taxi	MA-06-0066	\$450,000 (UMTA) \$300,000 (OST)	Oct. 1976- April 1979	TSC	John E. Ridgley (202) 426-8483
Bus Noise Reduction	OR-06-0005	\$100,000 (UMTA) \$65,000 (EPA)	July 1978- July 1979	Tri-County Metro- politan Transpor- tation District of Oregon	J. F. Campbell (202) 426-4035

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS may not have been published in sufficient quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

Study of Flywheel Energy Storage

Proj. CA-06-0106
L. J. Lawson, A. K. Smith, and G. D. Davis
1977, PB 282-652
5 vols.

Study of Flywheel Energy Storage

Proj. NY-06-0062
E. Lustenades, General Electric
Corporate Research
1977, PB 282-929

Project Definition for Evaluation of Battery Buses: Final Report

Proj. DC-06-0205
Transportation Assistance, Inc.
April 1978

Energy Absorbing Bumpers for Transit Buses: Transbus Program

Proj. IT-06-0025
Booz, Allen Applied Research
May 1976, PB 259-405/AS

Transbus Operational, Passenger, and Cost Impacts: Final Report

Proj. IT-06-0025
Booz, Allen Applied Research
July 1976, PB 269-911

The General Motors Transbus: Final Report

Proj. IT-06-0025

General Motors Corporation/Truck and Coach Division

May 1975, PB 262-637/AS-SET
Vol. I, Summary of Final Design, PB 262-638
Vol. II, Program Effort, PB 262-639
Vol. III, Appendix, PB 262-640

Rohr Industries Transbus: Final Report

Proj. IT-06-0025
Rohr Industries, Inc.
June 1975, PB 264-612/AS

Transbus Public Testing and Evaluation Program: Final Report

Proj. IT-06-0025
Simpson and Curtin
January 1976, PB 251-882/AS

Human Factors Evaluation of Transbus by the Elderly: Final Report

Proj. IT-06-0025
Booz, Allen Applied Research
May 1976, PB 264-757/AS

Transbus Safety and Human Factors

Proj. IT-06-0025
September 1977

Gas Turbine Engine Application in Transit Coaches

Proj. IT-06-0025
March 1977, PB 272-608

Transit Bus Propulsion Systems, Alternate Power Plant Installations

Proj. IT-06-0025
Booz, Allen and Hamilton, Inc.
September 1977, PB 276-612

Bus Interior Design for Improved Safety

Proj. IT-06-0025
Booz, Allen Applied Research
April 1976, PB 252-253/AS

Boarding Ramps for Transit Buses: Final Report

Proj. MD-06-0025
Booz, Allen and Hamilton, Inc.
May 1977, PB 269-290/AS

Transbus Engineering Test Program

Booz, Allen and Hamilton, Inc.
December 1977, PB 276-196/AS

Forecast of Urban 40-Foot Coach Demand: 1972-1990

Proj. IT-06-0025
Booz, Allen Research and Simpson and Curtin
December 1972, PB 222-684

Transit Bus Propulsion Systems State-of-the-Art

Proj. IT-06-0025
Booz, Allen Research, Inc., Development Inc.
August 1972, PB 222-871/AS

Baseline Bus Ride and Handling Test Methodology and Data Presentation

February 1976

Transit Bus Propulsion Requirements

January 1978

AM General Transbus: Final Report

AM General Corp.
November 1977

Booz-Allen Transbus: Final Report

Proj. IT-06-0025
Booz, Allen Applied Research
June 1978

Small Transit Bus Requirements Study: Final Report [Summary]

Proj. IT-06-0074
RRC International, Inc.
March 1977, PB 269-398/AS-Set of Six,
PB 269-392

Operations of Small Buses in Urban Transit Service in the United States

Proj. IT-06-0072

RRC International, Inc.

July 1975, PB 269-393/AS

Operating Profiles and Small Bus Performance Requirements in Urban Transit Service

Proj. IT-06-0074

RRC International, Inc.

December 1976, PB 269-395/AS-Set of Six

General and Performance Specifications for a Small Urban Transit Bus

Proj. IT-06-0074

RRC International, Inc.

December 1976, PB 269-397/AS-Set of Six

Guidelines for the Design of Future Small Transit Buses and Bus Stops to Accommodate the Elderly and Handicapped

Proj. IT-06-0074

RRC International, Inc.

March 1977, PB 269-396/AS-Set of Six

Bus Characteristics Needed for Elderly and Handicapped in Urban Travel

Proj. IT-06-0074

RRC International, Inc.

March 1976, PB 269-394/AS-Set of Six

Assessment of Battery Buses: Final Report

Proj. VA-06-0044

Trans Systems Corporation

July 1977, PB 271-321

Study of Future Paratransit Requirements: Scenario Report

Proj. IT-06-0104

Alan M. Voorhees and Associates, Inc.

November 1976, PB 262-629/AS

Study of Future Paratransit Requirements: Final Report

Proj. IT-06-0104

Alan M. Voorhees and Associates, Inc.

January 1977, PB 264-082/AS

Study of Future Paratransit Requirements: Executive Summary

Proj. IT-06-0104

February 1977, PB 265-821/AS

Assessment of Service Requirements and Design Characteristics of Present and Future Paratransit Vehicles

Proj. NY-06-0058

Ronald Adams

April 1977, PB 267-574/AS

Technology Delivery for a New Paratransit Vehicle: Final Report

Proj. PA-06-0039

Gellman Research Associates, Inc.

July 1977, PB 272-128/AS

A Study of Wheelchair Access to the Current Transit Bus Design: Final Report

Proj. MI-06-0017

AM General Corporation

April 1977, PB 270-101

Bus and Paratransit Operational Technology

Trends and Highlights



Besides making it possible for local communities to acquire new vehicles, establish public transit systems, and extend their public transportation services, UMTA also helps local transit systems to improve their day-to-day operations in a number of ways. One way is by making funds available to enable selected towns and cities to take advantage of current developments in computer technology as applied to transit and paratransit operations.

Under the Bus and Paratransit Operational Technology Program, one major objective is to foster the integration of fixed-route and paratransit services. This includes the development of computer programs that can be used to aid in the delivery and performance of paratransit services and to ensure that those services are integrated into regular systems.

Computer technology is used to assist paratransit operators in such varied activities as scheduling passengers and vehicles in dial-a-ride service, computing fares in shared-ride taxis, analyzing relationships between vehicle use and energy consumption, matching riders and drivers in carpool programs, and insuring efficient passenger transfer between paratransit and regular fixed-route transit service.

Another area of study in the operational technology program, Automatic Vehicle Monitoring (AVM), involves the development of a system to continually monitor, track and communicate with transit vehicles on city streets. This two-way digital communications, command and control system helps to insure that schedules are

maintained and that efficient and timely responses can be made to emergency situations. The AVM system could have other applications as well, such as in the taxi industry or police departments.

Paratransit Integration

Recent paratransit developments have extended public transportation into low density areas and provided mobility to the handicapped, elderly, poor and others. One or more of these services, such as dial-a-ride, carpools and vanpools, shared-ride taxis, subscription commuter services, and special programs for elderly and handicapped riders are now available in hundreds of United States communities.

Through research in the field of computer technology, the Bus and Paratransit Operational Technology Program is attempting to find solutions to transportation analysis, management and operating problems. Under the program, computer techniques and software are being developed to provide the needed tools for successful management of flexible paratransit services and for the coordination of those services with conventional fixed-route, fixed-schedule mass transit systems.

UMTA has supported research in computerized dial-a-ride systems since the mid-1970's when a successful pilot project was carried out in Haddonfield, N.J. Since that time, many paratransit programs in other cities have been planned and put into operation. One of the most widely studied is in Rochester, N.Y.

Rochester's integrated dial-a-ride system, supported by UMTA since 1975, has included the development of computer



This seven-passenger Checker sedan is part of a new fleet providing dial-a-ride service to residents of suburban Rochester, N.Y.



These Fortivan lift-equipped vans serve elderly and handicapped residents in suburban Rochester, N.Y.

software for scheduling and dispatching dial-a-ride vehicles. During FY 78 this project, entitled the Rochester Demonstration Support: Control Procedures Design Project (MA-06-0071), began to monitor and improve the computer control procedures for the system.

A laboratory was developed at the Transportation Systems Center (TSC) in Cambridge, Mass. (MA-06-0054), to study demand-responsive systems, and to

research the automatic routing and dispatching operations used by the Rochester system. In this project, a Tektronix 4081 interactive graphic display computer system was installed to analyze the mathematical model, or algorithm, used in Rochester's scheduling software.

The computer software developed for Rochester was converted, in the Paratransit Pilot System Software Project (MA-06-0054), for use in the Interdata 8/32 minicomputer. The use of the same

software on a minicomputer will allow the system to reduce operating costs.

In addition to the research conducted in Rochester, the program has studied the role that shared-ride taxi systems can play in an integrated paratransit network. In a study entitled Shared-Ride Taxi Requirements (MA-06-0054), the conditions under which the shared-ride taxi could operate at a reasonable profit were examined, as well as the computer support which the system would need for efficient operation. In a related study, Shared-Ride Taxi Fare Calculation System (PA-06-0040), a method was developed to electronically calculate fares, thereby resolving many of the inequities of current fare calculator systems.

Computer research projects were carried out in FY 78 to study a variety of issues related to the development of paratransit systems. One study, Paratransit Cost Benefit Analysis (MA-06-0054), investigated the benefits and costs associated with the use of integrated paratransit in urban and suburban areas. The study also analyzed and compared the conventional fixed-route bus and exclusive-ride taxi to determine the circumstances under which these conventional modes would be superior to paratransit and vice versa.

Another study, Paratransit Large Regional Analysis (IT-06-0150 and MA-06-0084), developed a parametric tool for analysis of the financial, level-of-service, environmental, and energy factors involved in developing area-wide, integrated, demand-responsive systems. Two different computer programs were designed, one using the traditional Urban Transportation Planning System computer package, and another model requiring less



Operators in the control room are aided by electronic displays as they match demand with supply in Rochester, N.Y.

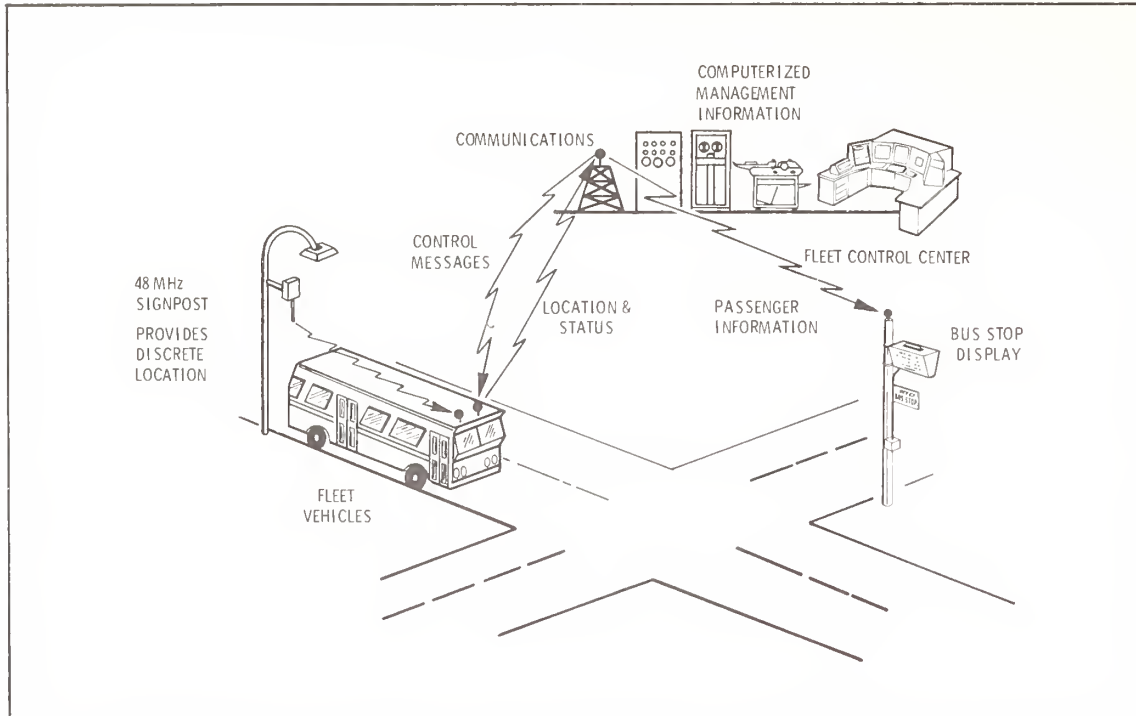
A Low Cost Ride-Sharing Computer System for Knoxville, Tenn., (DC-06-0160 and DC-06-0199) was undertaken in FY 78 to develop a low-cost microcomputer system to support Knoxville's ride-sharing programs. The computer system will serve to assist a transportation "broker," or coordinator, by matching transportation services with market demand.

The project was expanded to field test the scheduling algorithm using information on handicapped services for its data base, and also to design an algorithm for scheduling subscription bus services to multiple job sites.

Other computer technology projects have been developed to support local paratransit integration projects and to help inform the transportation community of current progress. One such project, Review and Assessment of Paratransit Operating Experience (MA-06-0054), has studied the experience of paratransit programs around the country. The project was designed to determine the type of computer models needed for integrated paratransit systems, and to develop a micro-level simulation computer model and a comprehensive planning document for paratransit planners, designers, and operators. The first two elements of the project were completed in FY 78; the last two elements will be completed in early FY 79.



also supports the program. This project has developed an address/product directory to be used as the data base of a microprocessor. A comprehensive catalogue with description of demand-responsive and integrated paratransit services and equipment is being prepared for distribution to the public.



Automatic Vehicle Monitoring [AVM] systems can pinpoint the exact location of vehicles and display them in real-time motion on computerized display panels.

Advanced Area-Coverage Automatic Vehicle Monitoring

Automatic Vehicle Monitoring (AVM) is an electronic system of monitoring the location and speed of transit vehicles operating on city streets. All vehicles are monitored by a computer and their location is shown in real-time on display panels in a control center. The display automatically indicates whether the bus is on schedule. If a bus is not on schedule, the computer issues instructions for the driver to follow to get the bus back on schedule. The system is applicable to a wide variety of

vehicles at the same time, including police, fire, postal, taxi and delivery vehicles.

An AVM system is made up of three subsystems: location, communications, and data processing. The location subsystem places vehicles to within 300 feet in the urban environment. The communications subsystem transmits location and speed information from the vehicle to the control center. The data processing subsystem compares vehicle location information to schedule information and automatically determines the optimum strategy to maintain scheduled service and sends the appropriate command to the bus via the communications link.


The AVM system is expected to result in better service to passengers and reduced operating costs. Buses will adhere more closely to schedules and headways, and this may result in fewer buses being required to maintain a given level of service. Data needed for management purposes can be collected automatically. AVM promotes greater passenger and operator security because a driver can instantly notify the control center of an emergency so the police can be alerted and given the exact location of the vehicle.

The AVM system is a long-term research, development, and evaluation program which began as Phase I in 1974. During the initial phase, four contractors competed in feasibility tests of their location-monitoring systems. Based on the results in the light of each contractor's system proposal, one contractor was selected to develop the Phase II system.

Phase II began in 1977. Los Angeles was selected as the project site because the police and the transit operators expressed a strong willingness to participate in the project. During Phase II, an area-coverage AVM system was developed and will be operated and evaluated. The system will be installed on four bus routes for transit operations. For random-route operations, vehicles can be tracked throughout a 30 square mile area. Up to 200 fixed-route transit buses and 15 random-route vehicles will be equipped.

During a one-year period starting in the summer of 1979, the automatic vehicle monitoring system will be tested and evaluated for its effect on transit system performance and operations. Detailed analysis will quantify the results and this analysis may qualify the AVM system for UMTA capital assistance funding.



				
LINE		VIA	TYPE OF SERVICE	NEXT BUS
83W	WILSHIRE BLVD SANTA MONICA	WILSHIRE BLVD	L	01 MIN
83B	WILSHIRE BLVD SANTA MONICA	BRENTWOOD	LF	01 MIN
83	WILSHIRE BLVD SANTA MONICA	WESTWOOD U.C.L.A.	F	05 MIN
83C	OWL SERVICE ONLY	CENTURY CITY	--	-- MIN
F - FULL BUS			L - LIMITED	-- SEE SCHEDULE
TIME				
4:35		FOR TRANSIT INFORMATION CALL 626-4455		

AVM systems are also able to relay accurate scheduling information to changing displays at bus stops.

Bus and Paratransit Operational Technology

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
PARATRANSIT INTEGRATION					
Rochester Demonstration Support: Control Procedures Design	MA-06-0071	\$250,000	Sept. 1975- July 1979	Massachusetts Institute of Technology	Edward Neigut (202) 426-8483
Paratransit: Large Regional Analysis	IT-06-0084	\$280,000	Nov. 1977- Dec. 1979	Systan, Inc.	Edward Neigut (202) 426-8483
Paratransit: Large Regional Analysis	MA-06-0084	\$250,000	Nov. 1977- Dec. 1979	Multisystems, Inc.	Edward Neigut (202) 426-8483
Low Cost Ride-Sharing Computer System for Knoxville, Tenn.	DC-06-0160 DC-06-0199	\$190,000	Dec. 1976- Oct. 1979	International Management Resources, Inc.	Edward Neigut (202) 426-8483
Computer Algorithm for Subscription Bus Scheduling	MD-06-0027	\$ 63,000	Oct. 1976- Jan. 1979	University of Maryland	Edward Neigut (202) 426-8483
Software Maintenance and Distribution	DC-06-0193	\$100,000	April 1977- April 1978	First Data Corp.	Edward Neigut (202) 426-8483
Shared-Ride Taxi Fare Calculation System	PA-06-0040	\$345,000	July 1974- March 1979	Carnegie-Mellon University	Edward Neigut (202) 426-8483
Paratransit Techni- cal Support and In- dependent Studies	DC-06-0175	\$120,000	March 1977- Sept. 1979	Transportation Assistance, Inc.	Edward Neigut (202) 426-8483
Paratransit Cost- Benefit Analysis	MA-06-0054	\$249,297	April 1977- Dec. 1978	TSC; Multi- systems, Inc.	Richard Gundersen (617) 494-2518
Review and Assess- ment of Paratransit Operating Experience	MA-06-0054	\$464,000	June 1977- Feb. 1979	TSC; Systan, Inc.	B. P. Bushueff (617) 494-2518

Bus and Paratransit Operational Technology

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
PARATRANSIT INTEGRATION					
Shared-Ride Taxi Requirements	MA-06-0054	\$215,297	Sept. 1976- Feb. 1979	TSC; Dave Systems, Inc.	Thomas Carberry (617) 494-2369
Paratransit Pilot System Software	MA-06-0054	\$ 85,000	Oct. 1977- Nov. 1978	TSC; First Data Corp.	Paul Connolly (617) 494-2205
Laboratory Facility	MA-06-0054	\$ 15,000	Oct. 1977- Oct. 1978	TSC	E. Johnson (617) 494-2462
Program Support: Paratransit Integration	MA-06-0054	\$ 95,000	July 1977- Oct. 1978	TSC; Systems Architects, Inc.	B.P. Bushueff (617) 494-2518
ADVANCED AREA-COVERAGE AUTOMATIC VEHICLE MONITORING PROGRAM					
Phase II, Systems Management of Multi-User AVM Demonstration Project	MA-06-0041	\$9,541,000	Sept. 1974- Dec. 1980	TSC; Gould Information Identification, Inc.	Denis Symes (202) 426-4035
Technical Support for Phase II AVM System	VA-06-0026 CA-06-0119			Mitre Corp. Southern California Rapid Transit District (SCRTD)	
Study of Loran-C Land Reception and Stability	DC-06-0211			OST	

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS may not have been published in sufficient quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

Field Testing of a Pulse Trilateration Automatic Vehicle Monitoring System in Philadelphia

Proj. MA-06-0041

J. F. O'Connor and A. H. Rice

August 1978, UMTA-MA-06-0041-78

Evaluation of Passenger Counter System for an AVM Experiment

Proj. MA-06-0041

A. Balaram, G. Gruner, and H. Thomas

September 1978, UMTA-MA-06-0041-78

Vibration Tests on Transit Buses

Proj. MA-06-0041

J. Anderson, A. Balaram, and H. Thomas

November 1978, UMTA-MA-06-0041-78

A Study of the Costs and Benefits Associated with AVM

Proj. MA-06-0041

Transportation Systems Center

February 1977, PB 266-293/AS

Experiments on Four Different Techniques for Automatically Locating Land Vehicles, A Summary of Results

Proj. MA-06-0041

June 1977, PB 270-251

A Comprehensive Field Test and Evaluation of an Electronic Signpost AVM System Final Report/Phase I

Proj. MA-06-0041

Hoffman Information Identification, Inc.

August 1977

Vol. I, Test Results, PB 272-907/AS

Vol. II, Appendix, PB 273-436/AS

Loran Automatic Vehicle Monitoring System: Phase I

Proj. MA-06-0041

Teledyne Systems Company

August 1977

Vol. I, Test Results, PB 274-955/AS

Vol. II, Appendices, PB 274-956/AS

Report on Phase One Tests of Fairchild Automatic Vehicle Monitoring [AVM] System: Final Report

Proj. MA-06-0041

Fairchild Space and Electronics Company

August 1977, PB 273-816/AS

Paratransit Pilot System Software Design and Functional Description

Proj. MA-06-0054

First Data Corporation

1978, DOT-TSC-1447

Paratransit Pilot System Software Operator Handbook

Proj. MA-06-0054

First Data Corporation

1978, DOT-TSC-1447

Paratransit Pilot System Software Installation Guide

Proj. MA-06-0054

First Data Corporation

1978, DOT-TSC-1447

Paratransit Pilot System Software Dial-A-Ride Street Name File System

Proj. MA-06-0054

First Data Corporation

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Paratransit Pilot System Software Terminal Handling System

Proj. MA-06-0054

First Data Corporation

1978, DOT-TSC-1447

Paratransit Integration Symposium Proceedings

Proj. MA-06-0054

Systems Architects, Inc.

June 1978, UMTA-MA-06-0054-78-2

Benefit-Cost Analysis of Integrated Paratransit Systems

Vol. I, Executive Summary

Vol. II, Introduction and Framework for Analysis

Vol. III, Scenario Analyses

Vol. IV, Issues in Community Acceptance and Integrated Paratransit Implementation

Vol. V, The Impacts of Technological Innovation

Vol. VI, Technical Appendices

Proj. MA-06-0054

Multisystems, Inc.

September 1978, UMTA-MA-06-0054-78

Paratransit Integration, Model Review and Requirements

Proj. MA-06-0054

Systan, Inc.

July 1978, DOT-TSC-1392

Paratransit Integration, State-of-the-Art Report

Proj. MA-06-0054

Systan, Inc.

December 1978, DOT-TSC-1392

Paratransit Integration Workshop Proceedings

Proj. MA-06-0054

Systems Architects, Inc.

August 1978, UMTA-MA-06-0054-78-18

**Integrated Dial-A-Ride and Fixed Route Transit
in Ann Arbor, Michigan**

Proj. MA-06-1083

Cambridge Systematics, Inc. and

Multisystems, Inc.

March 1977, PB 267-942/AS

**Shared-Ride Taxi Computer Control System
Requirements Study: Interim Report**

Proj. MA-06-0054

Dave Systems

August 1977, PB 275-335/AS

**Haddonfield Dial-A-Ride Demonstration, Third
Household Survey**

Proj. VA-06-0024

MITRE Corporation

March 1976, PB 257-033/AS

**Data Base Design for Demand-Responsive
Transit**

Proj. VA-06-0024

MITRE Corporation

July 1976, PB 256-820/AS

Dial-A-Ride Software Installation Guide

Proj. VA-06-0024

MITRE Corporation

September 1976, PB 258-333/AS

**Demand Responsive Transportation Planning
Guidelines [1976]**

Proj. VA-06-0024

MITRE Corporation

October 1976, PB 261-314/AS

Rail and Construction Technology

Trends and Highlights



During its first twelve years, UMTA's major activity in the area of urban rail transportation has been the construction of new urban rail systems and the extension of existing systems. Currently, however, the majority of rail capital grants are for the reconstruction of existing systems and the replacement of existing vehicles.

This emphasis on rehabilitation of existing facilities is expected to increase dramatically over the next decade. The Rail and Construction Technology Program intends to respond to the need for rehabilitation while at the same time seeking ways to reduce costs and to improve service on urban rail transportation systems.

The program seeks to promote the following benefits for operators and passengers of urban rail transportation systems: lower initial and life-cycle operating costs of rail vehicles and facilities; improvements in the reliability, maintainability, and availability of vehicles and systems; improved operations; and a safe environment for passengers and system personnel.

As of FY 78 the Rail and Construction Technology Program has been organized into four program elements: Vehicle and Equipment Technology, including research and development activities to promote short-term solutions to current problems; Requirements, Analysis and Evaluation, including evaluation of urban rail transit experience in order to guide research and development activities to best meet UMTA goals; Systems Integration and Deployment, including product standardization and product deployment to improve elderly and handicapped

accessibility, noise abatement, system safety and system reliability; and Construction Technology, including research and development activities to reduce the capital requirements and improve construction methods necessary for new systems and rehabilitation of existing systems.

Vehicle and Equipment Technology

Rapid rail systems characteristically operate underground, at grade, or on elevated guideways at speeds of up to 80 mph and with station spacing ranging from 1/2 mile to several miles. Currently, there are nine U.S. cities that have rail rapid transit systems in operation, under construction, or in final engineering: San Francisco, Chicago, Cleveland, Philadelphia, New York, Boston, Washington, Baltimore, and Atlanta. Together with commuter railroads, rail rapid transit systems carry more than two billion passengers annually, or one-third of all mass transit riders.

There is widespread interest in upgrading and extending existing rapid rail systems. Replacing old equipment, or acquiring new rolling stock, offer opportunities to apply new technology in rail system production.

Vehicle Prototypes and Subsystems

UMTA's Rapid Rail Program, up until the present time, has focused on the development of total vehicle designs and improved vehicle subsystems. Two prototype rapid transit vehicles have been developed: the State-of-the-Art car (SOAC), and the Advanced Concept Train

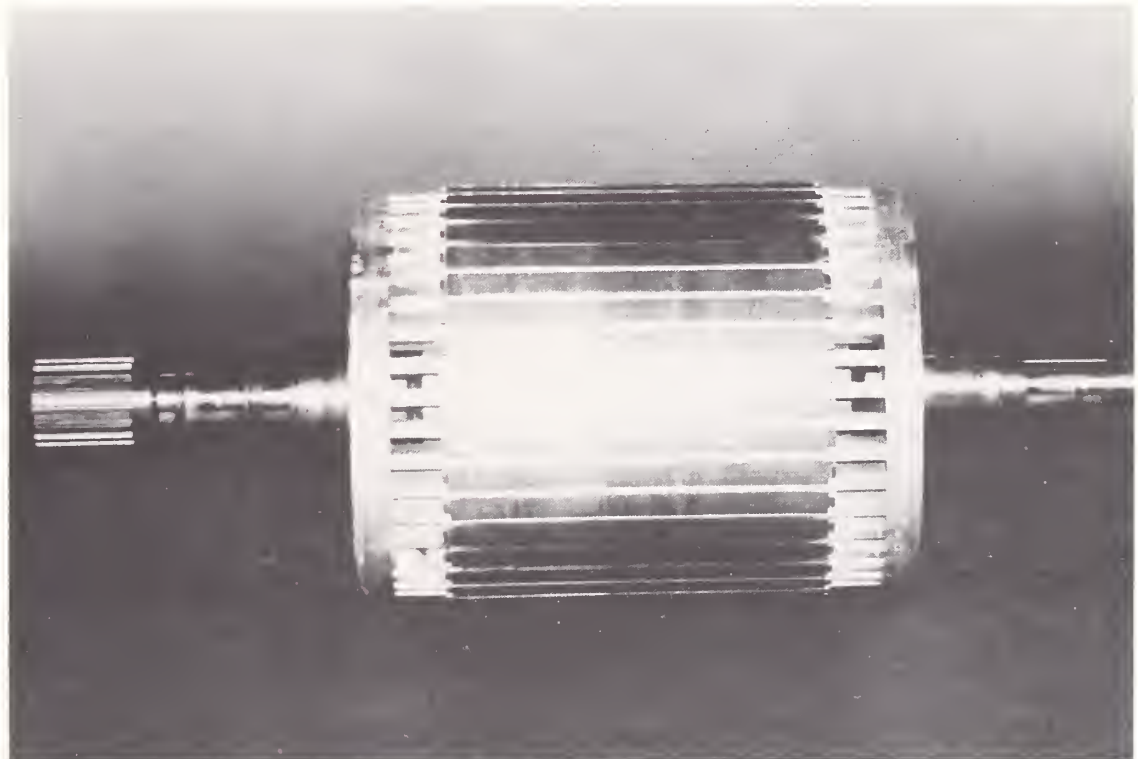
(ACT-1) (IT-06-0026).

Two State-of-the-Art cars were built, incorporating the best existing technology, and were tested in five cities—New York, Boston, Cleveland, Chicago, and Philadelphia. The SOAC's operated successfully in 20,000 miles of revenue service and carried 312,500 passengers.

The Advanced Concept Train was developed to test, evaluate and demonstrate the operation of subsystems which provide improved maintenance, reliability, and operating costs for future rapid rail cars. Features of the ACT-1 train include a new lightweight, easily

maintained monomotor truck using automotive concepts such as split axles, bolt-on ring-damped wheels, and copper disc brakes; an advanced flywheel energy-storage propulsion system; an aluminum frame with composite panel car-body for easy manufacture; an energy-absorbing system for low-speed impact control; and modular interiors for demand-tailored applications.

An ACT-1 test program at the Transportation Test Center, Pueblo, Colorado, involved an initial test and adjustment phase followed by engineering testing, acceptance testing, and finally



One element of the STARS program is this simple, rugged "squirrel cage" rotor which has aluminum conductor bars and caps welded together. There are no external power connections, transformer couplings, or semi-conductors.

10,000 miles of simulated revenue service. The engineering testing was performed over a range of speed performance profiles including weight loadings between empty and crush loads. The engineering testing also verified the approximate 30 percent energy saving features of the flywheel propulsion system. By November 1978, the vehicles had accumulated over 23,000 miles, including 11,000 miles of simulated revenue service. Based on the success of the flywheel propulsion system, UMTA is planning to retrofit 22 New York City subway cars with such systems in FY 80 to demonstrate acceptable levels of reliability and maintenance.

The Advanced Concept Train has been developed concurrently with the Advanced Subsystems Development Program (ASDP) (IT-06-0026). Under this program a number of promising subsystems designed for applicability to either existing or planned rapid transit vehicles have been developed. The objective of this program has been to develop subsystems that offered potential improvements over existing equipment. Subsystems developed under this program include an AC synchronous propulsion system (VA-06-0053), and a monomotor truck and a synchronous brake system (PA-06-0046). Testing of the ASDP truck and brake

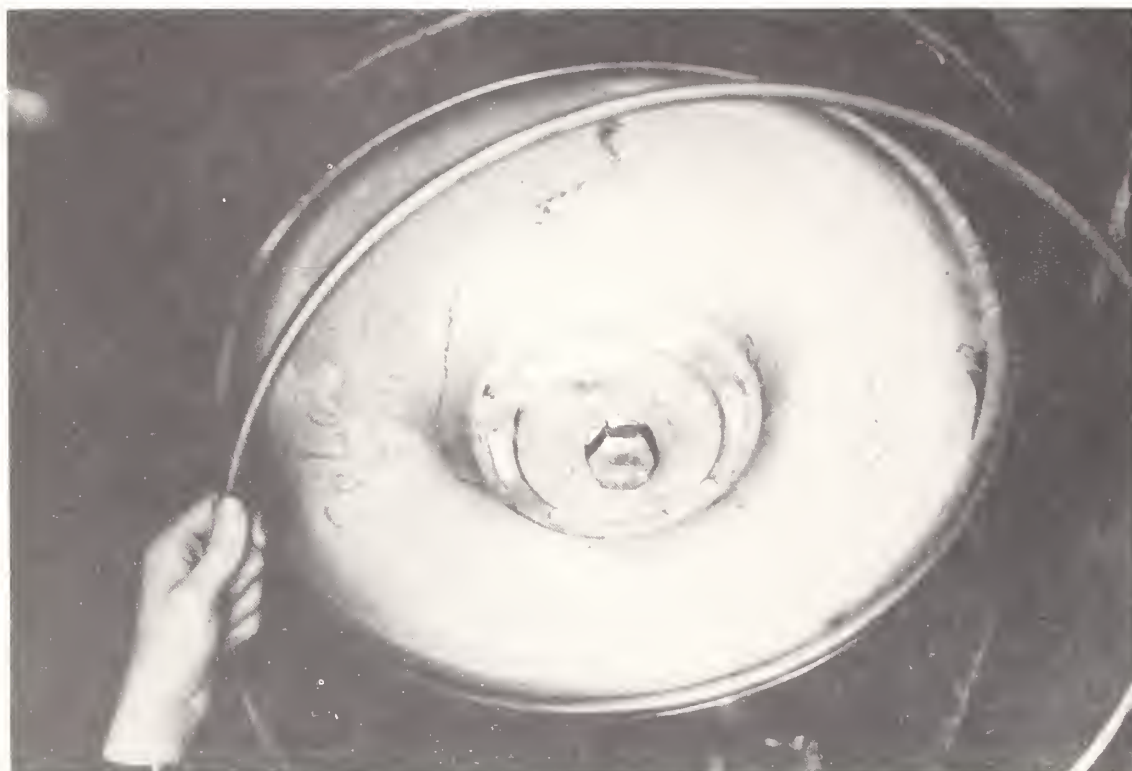
systems retrofitted into the SOAC vehicles is scheduled to be accomplished at the Transportation Test Center during 1979. Development of the synchronous propulsion system was terminated due to technical difficulties.

Subsystem Technology Applications to Rail Systems (STARS)

The ASDP program is being phased out and in its place will be a program of subsystem development which places more emphasis on providing solutions to the day-to-day problems of operating and maintaining a rapid rail transit system. This program, known as Subsystem Technology Applications to Rail Systems (STARS), will identify operational problems, apply existing technology to their solution and deploy these solutions in the near term. Generally a time span of three to five years is anticipated as being a realizable goal for the majority of the STARS program elements.

During FY 78 UMTA undertook activities to determine the most pressing needs of transit properties. Assessment teams visited nine transit properties for two-day discussions with top technical and financial personnel. The assessment teams included representatives from UMTA, the U.S. DOT Transportation Systems Center (TSC), the American Public Transit Association (APTA), and selected UMTA consultants.

A general objective of the STARS program is to recover the cost of the technology development and deployment through reduced operating costs, that is, to achieve a favorable cost/benefit ratio through technology application.



One noise abatement technique being tested by SEPTA is the ring-damped wheel shown above.

Data from the assessments was used to create a list of priority projects. Factors used in selecting the projects included pay-off potential (i.e. cost/benefit ratio), severity of the problem, and the time required to reach the deployment stage (technological risk). Among the kinds of projects to be undertaken are modular air conditioning, static auxiliary power supplies, multiplex systems, fare collection improvements, door improvements, escalator improvements, AC propulsion development, DC propulsion improvements and third rail de-icing devices. Work on the STARS projects is scheduled to begin in late 1978.

Requirements, Analysis and Evaluation

This program element is directed toward guiding the Rail and Construction Technology Program to meet the UMTA objectives of reduced life-cycle costs, improved performance, reliability and safety, energy conservation and elderly and handicapped accessibility. It provides a link between the experience and problems of existing urban rail systems and the research and development required to improve these systems and develop new ones. Under this effort, the urban rail transit market will be continually evaluated from supply and demand viewpoints, providing a basis for directing research and development efforts toward those areas with the highest potential for timely impact and greatest payoff from research and development dollars.

Four projects conducted during FY 78 — light rail vehicle cost reduction, WMATA technical assessment, track geometry measurement system (TGMS), and planning support — fell under this category.

Specifications for a new light rail vehicle (LRV) were developed in 1972 with participation of the transit industry and transit operators. In 1973 the Boeing Vertol Company was awarded a contract to design and manufacture LRV's for the San Francisco Municipal Railway and the Massachusetts Bay Transportation Authority. Because of a concern with the apparent high operating cost of the new car and the potentially higher cost for a new LRV bid to the "standard specification," an UMTA consultant critically reviewed the specifications for the purpose of recommending viable cost reduction changes which would not adversely affect performance (MA-06-0025). A final report has been issued on this study, and the specification is being revised to incorporate results of the study and other changes (i.e., four or six axle option) under the System Integration and Deployment program element.

Due to the problems experienced by the Washington, D.C. Metrorail (WMATA) system during its initial period of operation, a technical assessment of the system was conducted from April to October of 1978 (MA-06-0060). The assessment focused on current technical problems associated with the system, their impact on system availability and system costs, and alternative solutions to fixing the high priority problems. Information used by the assessment team came primarily through

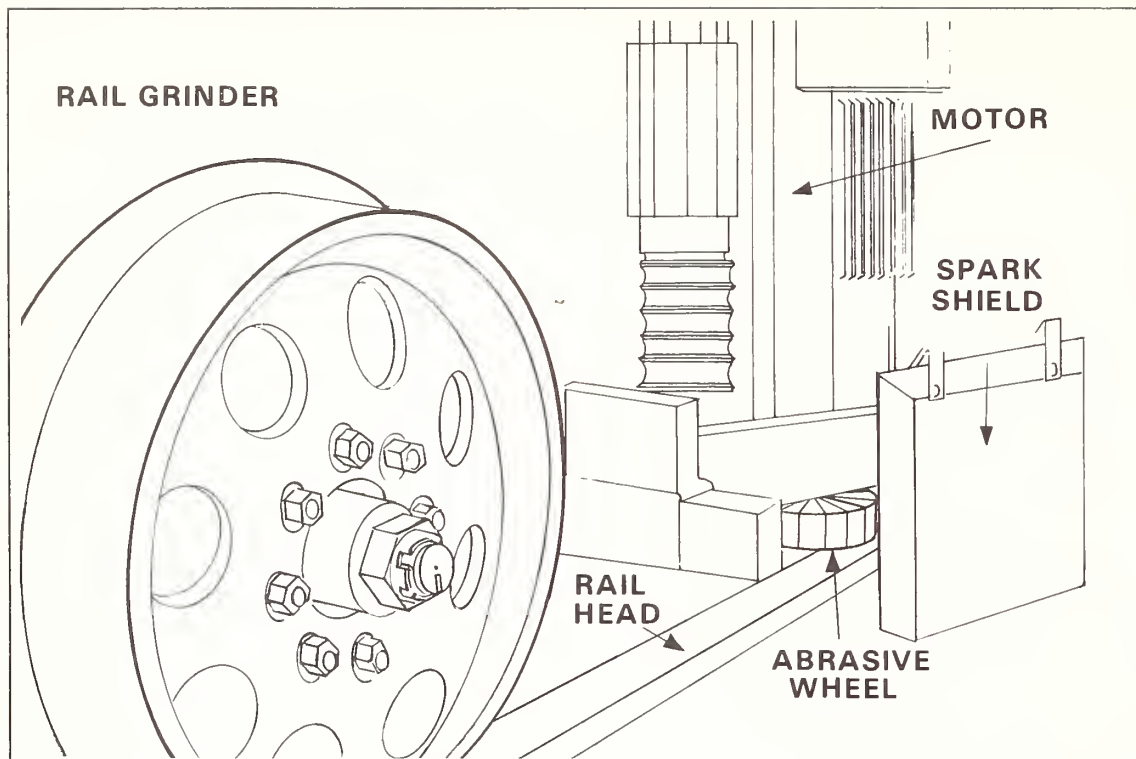
discussions with WMATA's technical staff, review of system documentation, and some independent analysis and tests. It was the judgement of the review team, upon completion of the assessment, that the general technical health of the system is good, but is being achieved, in some cases, through a high expenditure of maintenance dollars. A report was published in December 1978.

A Track Geometry Measurement System (TGMS) is a device which can be attached to any transit car and which identifies those portions of the track in need of improvement. A prototype TGMS was developed at the Transportation Systems Center and tested on the Toronto Transit Commission property for several months with successful results (MA-06-0025). The prototype TGMS has been requested by the New York City Transit Authority for an extended two-year evaluation of their system.

In addition, a planning support project was conducted involving a general technical assessment of the rail transit field and the development of a cost/benefit model for evaluating various rail transit technologies.

Systems Integration and Deployment

The Systems Integration and Deployment (SID) program is directed toward concurrent cost reduction, improved safety, noise abatement and accessibility for the elderly and handicapped. The program consists of the following subelements: standardization, project introduction, elderly and



The rail grinding apparatus illustrated above is one of several noise abatement techniques being tested by the Southeastern Pennsylvania Transportation Authority [SEPTA].

handicapped accessibility, the Transportation Test Center (TTC) construction and operation, urban rail noise abatement, and safety. Standardization is needed because of rapidly escalating system costs. Product introduction will help to fill the existing gap in the availability of federal assistance for new technology deployment. The program to promote elderly and handicapped accessibility is in response to recent Congressional policy decisions. The Transportation Test Center facilities provide a means of testing vehicles in a safe and controlled situation. Noise

abatement is needed to improve the quality of life in and around urban rail transit systems. Urban rail safety is a goal for which UMTA has been given a mandate.

Standardization

The rail transit equipment industry historically has responded to specifications developed by individual operators, resulting in a proliferation of customized designs. This approach is in contrast to the locomotive and bus industries which offer a range of standardized sizes and types of vehicles. The vehicles share common components, and the designs benefit from

the manufacturer's ability to improve the total product line in an evolutionary fashion without making previous models obsolete.

The street railway industry first utilized standardization with the development of the "PCC" car in the 1930's. Variations in such factors as length, width, and door placement were accommodated in a car with standard performance and subsystem interfaces. Thousands of such vehicles are now operating on systems in the United States and around the world.

UMTA first dealt with standardization when, in cooperation with the rail transit operators, it developed the *Guideline Specification for Urban Railcars*. These guidelines attempted to standardize the format for a technical specification.

Subsequently, UMTA began a two-phase project on standardization (IT-06-0131, IT-06-0175, DC-06-0121). The first phase involved a study of the feasibility of standardization. The second phase, now underway, is primarily concerned with the development of a standardized, or baseline, rapid transit car performance specification. Subtasks in the project include development of a methodology to be used in the selection of propulsion systems, a study on car body materials, a service-evaluated products list and uniform acceptance test procedures.

The American Public Transit Association (APTA) is assisting UMTA in reviewing technical materials, along with the Standardization Committee of the Railway Progress Institute, representing the supply industry.

A study of the feasibility of joint procurement by five potential rapid transit properties was added to the Phase II

tasks. Car procurements, scheduled for 1978-1979, were to be undertaken by Washington, D.C., Baltimore, Md., Miami, Fla., Cleveland, Ohio, and Philadelphia, Pa. The project contractor found that pairings were feasible for Baltimore and Miami, and Cleveland and Philadelphia. On the basis of this study, UMTA later recommended that the two paired groups proceed with joint specification development and joint purchase.

Under a related project (DC-06-0186) a series of *National Design Practices Manuals* are being developed. These manuals will assist transit planners and other transit professionals in planning new rapid rail transit systems or expanding and modernizing existing systems. The manuals will address issues of construction planning, safety, environmental acceptability, aesthetics, cost-effectiveness, operating efficiency, maintainability, reliability and standardization of system elements.

A detailed outline for the scope and content of the manuals is being developed by APTA under the project's first phase. In the project's second phase UMTA will select a contractor to develop the manuals. APTA will assist UMTA in reviewing draft technical materials in Phase II.

Elderly and Handicapped Accessibility

A new work statement for the design of a universal lift for rail vehicles is currently being developed. Previous work on a lift for light rail vehicles did not reach the completion stage. The new lift will be capable of adaption to any light rail vehicle, and possibly to commuter rail vehicles as well.

In addition, a Congressionally mandated study of elderly and handicapped accessibility to light and commuter rail is underway. This study will analyze the demand for light and commuter rail service, will survey system barriers to accessibility, will develop evaluation criteria, and will compare accessibility options, costs and alternatives.

Safety and Reliability Technology

Among the projects related to safety and reliability has been an effort by UMTA to develop a smokeless cable for use in rail transit systems. The characteristics of signal wires and power cables used by the rail transit industry were evaluated and ranked. Characteristics considered were flammability, smoke toxicity and various other physical properties. Flammability, smoke, electrical, and toxicity tests were conducted, using wire samples provided by the transit industry.

Studies of the crashworthiness of urban rail vehicles were conducted to investigate the effect of crashes on passenger survival and to assure that technology is utilized to maximize passenger protection (MA-06-0025). A workshop was held at TSC to report results to the transit industry and make recommendations for future work.

Fire safety in urban transit tunnels is also being studied (MA-06-0025). This project is actually a continuation of the prior Subway Environmental Simulation Program, which developed a model to evaluate fire safety at any point in the subway by simulating a fire. This model permits emergency evacuation plans and

gives information on control of the ventilation system. This current project will increase the model's predictive capabilities and will make the program less costly and easier to run. The model will be modified to run on TSC facilities, where it will be readily available to all transit properties.

Noise Abatement Technology

The purpose of the urban rail noise abatement program is to reduce the environmental impact of noise caused by existing transit systems, and to reduce the cost of noise control through the development and deployment of new and improved data, methods and hardware.

The Transportation Systems Center has prime responsibility for planning and technically directing work on the urban rail noise abatement program (MA-06-0025). A previous TSC effort resulted in the development of a national assessment of urban rail noise which summarizes and compares the noise exposure of patrons and community residents caused by urban rail rapid transit operations in the U.S. A draft report on the assessment was prepared, and a final report is expected to be published in spring of 1979. Additional work was undertaken toward refining the noise assessment and cost estimates for noise abatement on the New York City Transit Authority rapid transit system. A final report has been issued on this work.

Four types of noise abatement techniques have undergone in-service testing on the Southeastern Pennsylvania Transportation Authority (SEPTA) rail transit system (MA-06-0025). These four techniques include resilient wheels, ring-damped wheels, wheel truing, and rail grinding. The objective of this activity is to

develop definitive engineering data on long-term costs and performance of these noise control techniques and to organize this data so as to allow estimates of costs and performance for any urban rail transit system in the U.S. At this point, all testing has been completed, and three interim reports have been published. Based on the results of this study, several transit systems are planning their own studies of ring-damped wheels.

Radial steering trucks will be evaluated as another possible noise abatement technique. It is anticipated that a steerable truck will reduce noise and wheel/rail wear by reducing the wheel/rail lateral forces and the angle of attack. A competitive contract consisting of a design feasibility phase, a prototype evaluation phase, and a test phase will be conducted. A product introduction phase will follow if the results of the evaluation demonstrate the cost effectiveness of this approach. A project plan has been developed and a procurement for design feasibility studies has been initiated.

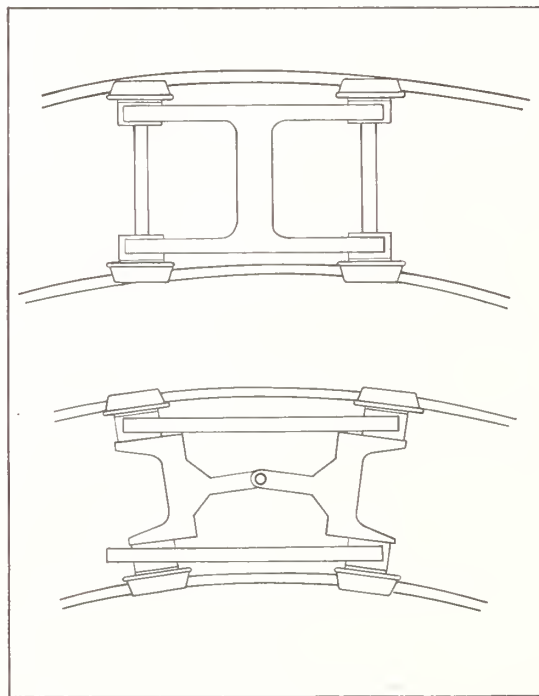
Urban rail elevated structures have the greatest environmental noise impact of all parts of the urban rail system. Research is underway to assess this impact and design ways to control it. Included in the research will be an inventory of urban rail elevated structures in the United States, computer implementation of elevated structure noise models, design guidelines for control of noise from existing elevated structures and an experimental design for the in-service testing of selected treatments. The approach will utilize previously developed analytical models, the results of existing field data on elevated structure noise, and limited additional test data. At

the end of FY 78, noise rating criteria for elevated rapid transit structures had been developed, the parameters to be included in the elevated structures inventory had been identified, and the existing literature on elevated structure noise control was reviewed.

Future noise abatement work will emphasize development of improved noise control techniques, in-service testing of these techniques, and dissemination of the new technology to the transit industry.

Transportation Test Center

The Transportation Test Center (TTC), managed by the Federal Railroad



One way to reduce wheel squeal may lie in the improvement of the wheel design. An experimental wheel with a hinged joint [bottom] allows the axles to align themselves with the radius of the track curve. The conventional wheel is shown at the top.

Administration, operates and administers an intermodal center for comprehensive testing, evaluation, and associated development of ground transportation systems and their components by Department of Transportation organizations, other government agencies and private industry.

The urban rail test facilities at the TTC consist of a 9.1 mile oval, electrified rail transit test track, and a power system for energizing the track, repair, maintenance and support facilities. The rail transit test track is designed for the test and evaluation of urban rail vehicles—light, rapid and commuter rail. A second purpose of the track is the development, test and evaluation of state-of-the-art track structures.

In addition to the conventional contact rail electrification, about two miles of simple overhead power wires have been constructed over part of the track to permit test and evaluation of urban rail vehicles using overhead power collection systems, such as light rail vehicles and commuter cars.

A permanent power system has been installed and will be ready for use in early 1980. Two substations will be located on the oval test track, and computer controls will facilitate simulation of various voltage profiles as required.

Located also at TTC is a Rail Dynamics Laboratory (RDL), designed to simulate rail dynamics for the purpose of studying the periodic and random oscillations of rail vehicles.

Currently in the construction phase at TTC is a tight turn loop, a 150-foot radius curve track which will enable the validation of wheel/rail noise phenomena. A section

of perturbed track is also being designed which will consist of a two-mile section of track with built-in sinusoidal perturbations of 25-foot wave length and 1/4" single amplitude displacements.

Other features of the center include a track scale capable of weighing individual vehicle axles up to 70,000 pounds with resolution of .005 percent and a state-of-the-art wheel truing machine to control the profile of a steel wheel.

Construction Technology

The Construction Technology program deals with the problems of rapidly increasing construction costs and deteriorating transit facilities. The increasing construction costs of new or expanding transit systems are largely related to institutional factors which limit

the use of new technologies, contracting practices, and management procedures to reduce cost.

The future of new rail systems depends on the effectiveness of research and development in reducing capital requirements and improving construction procedures and management. The need for rehabilitation and reconstruction will increase rapidly in the future. It is projected that U.S. transit agencies will request nearly \$15 billion in federal aid over the next ten years for rehabilitation and modernization. The enhancement of the structural integrity and reliability of these deteriorating facilities is of increasing importance.

Elevated Structures

A new type of girder for use in elevated rail transit structures is being evaluated under a grant with Metropolitan Dade County, Florida. "Double tee" twin girders are being compared with standard box girders (FL-06-0017). For Dade County, three test sections of twin girders are undergoing static and dynamic testing. If the twin girders prove successful, they will be an option for future construction of elevated rail transit systems in Miami and other cities. Because twin girders are made by a single-pour concrete process, it is believed they will be cheaper to manufacture than other types of girders.

Future efforts related to elevated structures will include the evaluation of mathematical models to predict the performance of different types of structures under a variety of conditions. Work will also commence on a review of design criteria used to construct elevated structures in the United States. The



Power substations have been constructed at the Transportation Test Center to supply electricity for rail car testing. Pike's Peak is in the background.

product will be an optimum design criteria, which in turn will become part of the National Design Practices Manuals.

Track and Wayside Technology

The Track and Wayside Technology Program was initiated in FY 77 to achieve UMTA's goals of increased track performance, reliability, safety, reduced overall costs and the optimum use of rapid

transit track. Every effort is being made to coordinate activities with the various U.S. transit companies. This will insure that research efforts are directed toward solving real problems and that results are implemented by the transit industry. Through these cooperative efforts, the UMTA track research program will result in track design standards, construction standards, and maintenance guidelines.

A project to evaluate the design of standard specification concrete ties for rapid transit tracks has been initiated (MA-06-0025). Concrete ties were manufactured and tested to demonstrate technical feasibility. A demonstration of concrete ties on a section of the WMATA system is scheduled for 1980.

In a related effort, the effect of vehicle-induced forces on the rails, ties and fastenings of rapid rail tracks will be performed. Experimental data will be generated using the TTC test loop and will be used to validate analysis tools developed under previous efforts.

A general study is being carried out to evaluate overall U.S. rapid transit track conditions, design, construction, as well as, maintenance problems and practices (MA-06-0025). Based on this inventory and on cost/benefit analyses, track and wayside research requirements will be prioritized.



The Rail Dynamics Laboratory at the Transportation Test Center near Pueblo, Colo., includes a Roll Dynamics Unit which recreates track movement for railcars, locomotives, and transit vehicles by "rolling" them in place under controlled conditions.

Tunneling Technology

The UMTA tunneling program was initiated in support of the U.S. Department of Transportation Tunneling Program Plan. This is an effort begun in FY 73 to reduce the costs of urban underground construction, accelerate the rate of construction, educate planners in the proper use of tunnels, and optimize the use of tunnels in urban transportation systems. The types of research conducted within the program include: economic analysis and planning, contracting and management practices, materials handling and utilization, maintenance, ground control and stabilization, design and construction standards and transit system environment criteria.

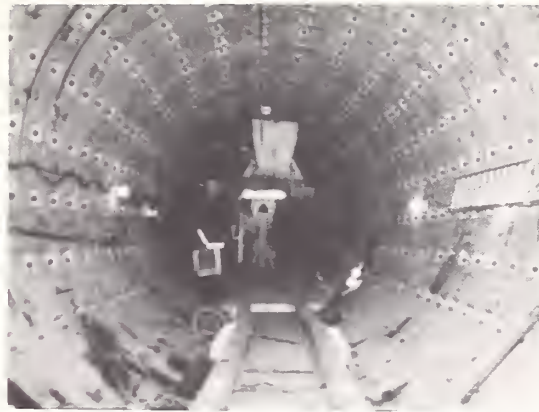
Several tunneling studies are being conducted in the area of ground control and stabilization. An evaluation of soil and construction parameters affecting ground movements around tunnels is being performed, and recommendations for procedures to predict and control these movements are being developed.

The study correlates ground movements due to tunneling with damage caused to structures and utilities. This information will be used to select methods to protect structures near tunnel excavations.

The Washington Area Metropolitan Transit Authority (WMATA) has a grant to study the use of chemical grout to stabilize soil support systems around tunnels (DC-06-0158). Heavily grouted, moderately grouted, and ungrouted sections of the WMATA Addison Route were compared using geotechnical instrumentation to measure ground settlements. Results of the study supported the use of chemical grout.

During site explorations for the extension of a Massachusetts Bay Transportation Authority (MBTA) line, innovative geotechnical methods will be used to predict subsurface conditions in "critical" construction zones (MA-06-0025). Resulting predictions will be compared with the actual conditions encountered in excavation. In addition, ground movements will be monitored as tunnel excavation proceeds.

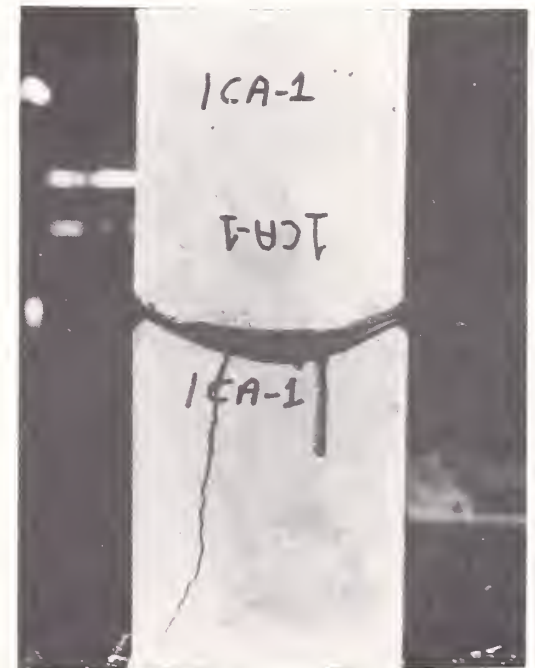
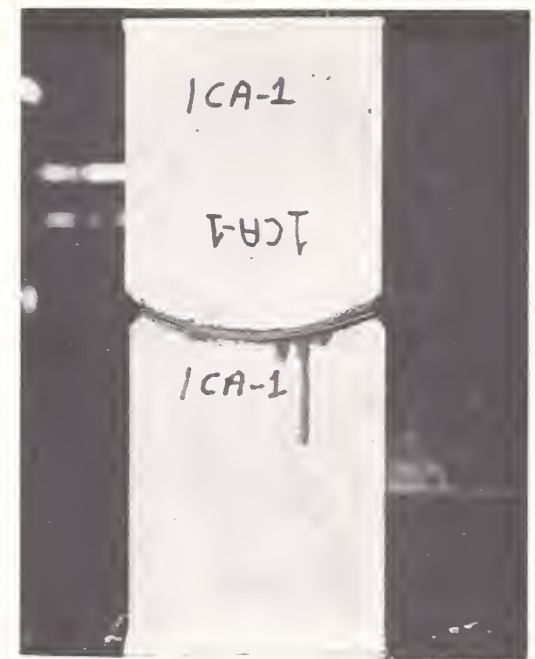
Another study will investigate the actual state of stress on tunnel supports after construction has begun (MA-06-0025). Improved designs for tunnel supports will be an outcome of this research.

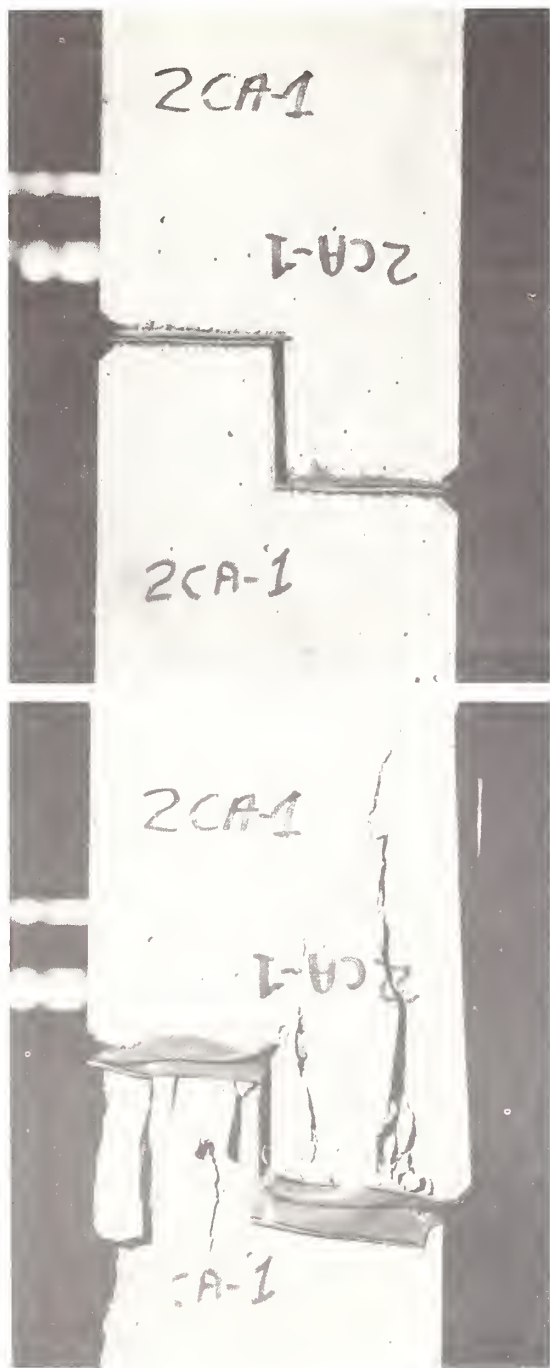


This newly constructed tunnel in Baltimore, Md., is made with bolted precast tunnel liners, the first such rail tunnel in the country. The Metropolitan Transit Authority of Baltimore will compare these liners with the conventional fabricated steel ones.

Several types of tunnel support systems are being studied under UMTA grants. The Metropolitan Transit Authority (MTA) of Baltimore, Md., is evaluating the use of precast concrete tunnel liners in its Lexington-Market tunnels (MD-06-0029 and MD-06-0039). The precast liners will be compared to fabricated steel liners as to fabrication techniques, rejection rates, handling and storage procedures, curing process, erection procedures, structural behavior and cost. This tunnel test section will demonstrate the first use of bolted precast concrete tunnel liners in U.S. rail transit construction.

A study of various joint configurations and sealant materials for use in concrete tunnel liners is being conducted (MA-06-0025). Precast units generally have difficulty in maintaining joint seals and this sometimes interferes with proper tunnel erection. Special equipment was developed to test creep characteristics,





watertightness, corrosion resistance, hydrostatic pressure and fire resistance. Various joint configurations have been tested including those proposed for use in Baltimore's subway system. Polymer concrete has been tested for possible weight reduction, increased alkalinity resistance and better strength properties.

Guidelines for the structural design of tunnels based on the ultimate strength concepts of concrete behavior are being developed (MA-06-0025).

The development of an extruded tunnel liner is being undertaken (MA-06-0025). This project will begin with laboratory research and development, and will end with field tests and demonstrations of extruded tunnel liners.

The Metropolitan Atlanta Regional Transit Authority (MARTA) will evaluate rock bolts and shotcrete as the primary support system for rock stations and tunnels through test sections in the MARTA system. Both conventional and

steel-fiber shotcrete will be tested as part of this project (GA-06-0007).

Problems encountered in the removal of rock and earth from tunnel excavation sites have been addressed by two projects. A materials handling systems study will evaluate methods and equipment used to remove material from tunnel excavation sites (MA-06-0025). More efficient and less expensive methods and equipment will be sought. A project undertaken by WMATA will involve development of a plan for use of the muck excavated from sections of WMATA's Glenmont Route (DC-06-0209). The basis for this study will be the *Muck Utilization Handbook* developed under a previous UMTA-sponsored study. The WMATA project will include investigation of alternatives, evaluation of public and private land development uses, and development of a cost-effective plan for use of the excavated material.

Fracture control methods of tunnel blasting will be compared with conventional smooth wall blasting methods under another study (MA-06-0025). As part of this study, fracture control procedures will be carried out in a pilot tunnel to be constructed as part of the Red Line Extension of the Massachusetts Bay Transportation Authority (MBTA).

Construction costs of tunneling are also being studied (MA-06-0025). Regression analyses on data from specific projects have been used to develop a computerized soft-ground tunnel cost estimating technique. Future work will involve expansion of the computer model. The socio-economic impacts of tunnel construction in urban areas are also being studied. A behavioral model will be

The durability of precast concrete used in tunnel liners depends on proper joint design and sealing. In the two before-and-after tests shown above, the knuckle and lap joints were tested for their ability to withstand pressure.

developed and tested which will measure the disruptive effects of tunnel construction.

The possibility of standardization within the tunneling industry is being investigated through another contract (DC-06-0182). The need and potential for standardization will be assessed through identification and comparison of tunnel parameters. Areas in which standardization is most economically and technically feasible will be identified.

A tunnel-related project has been undertaken which studied the pressure pulse effects of trains entering tunnels (MA-06-0025). Model trains were catapulted into small-scale tunnels to produce pressure transients thus simulating the actual effect of a train entering a tunnel. The model portals were modified to attenuate the pulses. The estimated cost of full scale portal modification was compared to alternative methods.



A new technique to control fractures when blasting tunnels is being demonstrated in the MBTA [Boston, Mass.] Red Line extension. Instead of the conventional method of smooth wall blasting, a broaching tool is used to scribe notches in the sides of the drill holes which act as starting points for crack initiation.

Rail and Construction Technology

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
VEHICLE AND EQUIPMENT TECHNOLOGY					
Advanced Concept Train	IT-06-0026	\$27,350,000	Dec. 1970- Sept. 1979	Boeing Vertol Co.; Garrett AiResearch	Stephen Teel (202) 426-0090
Advanced Systems Development Program (ASDP)	IT-06-0026	\$8,825,000	Jan. 1973- Nov. 1978	Boeing Vertol Co.	Stephen Teel (202) 426-0090
ASDP Propulsion Assessment	VA-06-0053	\$225,000	Aug. 1978- May 1979	Metrek Co.	Stephen Teel (202) 426-0090
ASDP Unpowered Testing	PA-06-0046	\$425,000	Nov. 1978- May 1980	Budd Co.	Stephen Teel (202) 426-0090
STARS (Subsystem Technology Applications to Rail Systems)				To be selected	Stephen Teel (202) 426-0090
REQUIREMENTS, ANALYSIS AND EVALUATION					
Planning Support	CA-06-0116	\$200,000	May 1978- Aug. 1979	Lawrence Berkley Laboratories	Stephen Teel (202) 426-0090
WMATA Technical Assessment	MA-06-0060	\$200,000	Feb. 1978- May 1978	Lawrence Berkley Laboratories	William Rhine (202) 426-9545
LRV Cost Reduction	MA-06-0025	\$75,000	Jan. 1978	N.D. Lea and Associates	Jeffrey Mora (202) 426-0090
Track Geometry Measurement System	MA-06-0025	\$305,000	Sept. 1976- March 1978	Systems Technology Associates, Inc.	John Nickles (617) 426-2204
SYSTEMS INTEGRATION AND DEPLOYMENT					
Railcar Standardization	IT-06-0131 IT-06-0175 DC-06-0121	\$1,300,000	May 1976- Sept. 1979	PB Decision Group; American Public Transit Association (APTA)	Jeffrey Mora (202) 426-0090

Rail and Construction Technology

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
SYSTEMS INTEGRATION AND DEPLOYMENT					
National Design Practices Manuals	DC-06-0186	\$350,000	Aug. 1978- Sept. 1979	APTA	Jeffrey Mora (202) 426-0090
Smokeless Cable	MA-06-0025	\$212,000	July 1976- Dec. 1978	TSC; FAA, Civil Aeromedical Institute; Boeing Co.	Paul Spencer (202) 426-0090
Elderly and Handicapped	MA-06-0025 PA-06-0034 CA-06-0175	\$1,000,000	Sept. 1977- Dec. 1981	TSC; Boeing Vertol Co.; Crain and Associates; TRAAC Associates	Jeffrey Mora (202) 426-0090
Vehicle Crash-worthiness	MA-06-0025	\$540,000	Sept. 1972- Sept. 1978	TSC; Illinois Institute of Technology; Calspan Corp.; Boeing Vertol Co.	Paul Spencer (202) 426-0090
Handbook of Urban Rail Noise and Vibration Control	MA-06-0025	\$110,000	Sept. 1978- Dec. 1979	TSC; Wilson, Ihrig and Associates	Leonard Kurzweil (617) 494-2142
In-Service Test and Evaluation of Wheel-Rail Noise Control Treatments on SEPTA	MA-06-0025	\$470,000	July 1975- April 1979	TSC; DeLeuw Cather and Co.; Wilson, Ihrig and Associates	Leonard Kurzweil (617) 494-2142
Elevated Structures	MA-06-0025	\$350,000	June 1978- July 1980	TSC; Bolt, Beranek and Newman, Inc.	Leonard Kurzweil (617) 494-2142
Steerable Truck	MA-06-0025	\$450,000	Aug. 1977- July 1981	TSC	Paul Spencer (202) 426-0090
CONSTRUCTION TECHNOLOGY					
Double Tee Girders Full Scale Test	FL-06-0017	\$388,000	July 1978- Sept. 1979	Metropolitan Dade County, Office of Transportation Administration, Fla.	Gilbert Butler (202) 426-0090

Rail and Construction Technology

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
CONSTRUCTION TECHNOLOGY					
Standard Specifications for Concrete Ties for Rapid Transit	MA-06-0025	\$94,000	Sept. 1977- Dec. 1978	TSC; Portland Cement Association	Paul Witkiewicz (617) 494-2006
Transit Track System Study	MA-06-0025	\$226,000	April 1978- July 1979	TSC; Ensco, Inc.	Gerald Saulnier (617) 494-2006
Vehicle-Induced Forces	MA-06-0025	\$225,000	Oct. 1978- Dec. 1979	Kaman Avidyne	John Putukian (617) 494-2206
Transit Track Noise Test Section	IL-06-0042	\$500,000	Nov. 1978- Nov. 1979	Chicago Urban Transportation District, Ill.	Gilbert Butler (202) 426-0090
Tunnel Standardization	DC-06-0182	\$110,000	May 1977- Dec. 1978	Delon Hampton and Associates	Gilbert Butler (202) 426-0090
Materials Handling Systems Study	MA-06-0025	\$203,000	Jan. 1977- Oct. 1978	TSC; Holmes and Narver	James Lamond (617) 494-2544
Socio-Economic Impacts	MA-06-0025	\$341,000	Sept. 1977- Sept. 1980	TSC; Abt Associates, Inc.	Robert Thibodeau (617) 494-2389
Economic Factors	MA-06-0025	\$500,000	Sept. 1975- Sept. 1981	TSC	Robert Thibodeau (617) 494-2389
Tunnel Liners and Sealants	MA-06-0025	\$575,000	Feb. 1976- Aug. 1979	TSC; Bureau of Reclamation, Civil Engineering Research Center	James Lamond (617) 494-2544
Tunneling Technology Workshops and Seminars	MA-06-0025	\$95,000	May 1978- Nov. 1979	TSC; Pacific Consultants	Santo Gozzo (617) 267-6622
Tunnel Design and Construction	MA-06-0025	\$305,000	May 1978- Nov. 1979	University of Illinois at Champaign-Urbana	Gilbert Butler (202) 426-0090

Rail and Construction Technology

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
CONSTRUCTION TECHNOLOGY					
MBTA Site Exploration	MA-06-0025	\$412,000	Oct. 1978- Nov. 1979	TSC; Bechtel Corp; Haley and Aldrich, Inc.	Phillip Mattson (617) 494-2431
Alleviation of Pressure Pulse Effects for Trains Entering Tunnels	MA-06-0025	\$95,000	March 1977- Dec. 1978	TSC; California Institute of Tech- nology, Jet Propulsion Laboratory	Timothy Barrows (617) 494-2758
Chemical Grout Test Section	DC-06-0158	\$85,000	Sept. 1976- Oct. 1978	WMATA, Washington, D.C.	Gilbert Butler (202) 426-0090
Precast Concrete Liners Test Section	MD-06-0029 MD-06-0039	\$470,000	Oct. 1978- Oct. 1980	MTA, Baltimore, Md.	Gilbert Butler (202) 426-0090
Rock Station and Tunnel Test Section	GA-06-0007	\$400,000	Aug. 1977- Aug. 1979	MARTA, Atlanta, Ga.	Gilbert Butler (202) 426-0090
Design Recommenda- tions for Concrete Tunnel Liners	MA-06-0025	\$350,000	April 1978- April 1981	University of Illinois at Champaign-Urbana	Gerald Saulnier (617) 494-2006
Muck Utilization	DC-06-0209	\$81,000	Nov. 1978- Nov. 1979	WMATA, Washington, D.C.	Gilbert Butler (202) 426-0090
Improved Design Procedures for Tunnel Supports	MA-06-0025	\$97,000	Jan. 1978- Feb. 1979	TSC; Massa- chusetts Institute of Technology	Larry Silva (202) 426-2351
Development of an Extruded Tunnel Lining System	MA-06-0025	\$2,051,000	Jan. 1978- July 1981	TSC; Foster Miller Associates, Inc.	Gerald Saulnier (617) 494-2006
Subway Environmental Simulation: Emergency Ventilation	MA-06-0025	\$163,000	Nov. 1978- April 1980	TSC; Parsons, Brinkerhoff, Quade and Douglas	Neil Meltzer (617) 494-2192
Fracture Control in Tunnel Blasting	MA-06-0025	\$74,000	Sept. 1978- Sept. 1979	TSC; Haley and Aldrich, Inc.	Paul Witkiewicz (617) 494-2006

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS may not have been published in sufficient quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

Urban Rapid Rail Vehicle and Systems Program: Annual Report

Proj. IT-06-0026
Boeing Vertol Company
October 1976, PB 266-096/AS

Determination of the Optimal Approach to Rail Rapid Transit Car Standardization

Proj. IT-06-0131
International Research and Technology Corp.
August 1976, PB 259-363/AS

Muck Utilization Planning, Urban Transportation Tunneling: A Handbook of Rational Practices for Planners and Designers

Proj. MA06-0025
Haley and Aldrich, Inc.
May 1977, PB 272-139/AS

MARTA Tunnel Construction in Decatur, Georgia: A Case Study of Impacts

Proj. MA-06-0025
July 1977, PB 271-366

Proceedings: Workshop on Materials Handling for Tunnel Construction

Proj. MA-06-0025
Colorado School of Mines
August 1977, PB 276-602/AS

Muck Utilization in Urban Transportation Tunneling Process: Final Report

Proj. MA-06-0025
Haley and Aldrich, Inc.
December 1977, PB 278-066/AS

Subway Environmental Design Handbook, Volume I Principles and Applications: Second Edition

Proj. DC-06-0010
Transit Development Corporation, Inc.
March 1976, PB 254-788/AS

Roster of North American Rapid Transit Cars 1945-1976

Proj. DC-06-0121
American Public Transit Association
January 1977, PB 266-620/AS

Flywheel Propulsion Simulation: Final Report

Proj. MA-06-0044
Alexander Kusko, Inc.
May 1977, PB 272-259/AS

Engineering Tests for Energy Storage Cars at the Transportation Test Center

Proj. MA-06-0025
May 1977, Vols. I-IV, PB 269-399
Vol. I, Program Description and Test Summary, PB 269-400
Vol. II, Performance Power Consumption and Radio Frequency Interference Tests, PB 269-401
Vol. III, Noise Tests, PB 269-402
Vol. IV, Ride Roughness Tests, PB 269-403

Urban Rail Supporting Technology: A Five Year Progress Summary 1971-1976

Proj. MA-06-0025
Transportation Systems Center
June 1976, PB 259-090/AS

Rail Transit System Cost Study, Revision I: Final Report

Proj. MA-06-0025
Thomas K. Dyer, Inc.
March 1977, PB 266-918/AS

Insurance for Urban Transportation Construction

Proj. MA 06-0025
Cresheim Co., Inc.
June 1977, PB 272-108

General Vehicle Test Instrumentation Evaluation: Final Report

Proj. MA-06-0025
Transportation Systems Center
March 1977, PB 269-598/AS

General Vehicle Test Instrumentation Manual: Operational Handbook

Proj. MA-06-0025
Transportation Systems Center
September 1977, PB 274-543/AS

Proceedings: Seminar on Underground Construction Problems, Techniques and Solutions Chicago, Illinois, October 20-22, 1975

Proj. MA-06-0025
Chicago Urban Transportation District
December 1976, PB 264-027/AS

Subsurface Exploration Methods for Soft Ground Rapid Transit Tunnels

Proj. MA-06-0025
Parsons, Brinckerhoff, Quade and Douglas, Inc. and Soil and Rock Instrumentation, Inc.
April 1976, PB 258-342/AS-SET
Vol. I, Sections 1-6 and References
Vol. II, Appendices A-F

Assessment of Disruptive Effects Associated With Urban Transportation Tunnel Construction

Proj. MA-06-0025
ABT Associates, Inc.
June 1976, PB 256-848/AS

Guidelines for Improved Rapid Transit Tunneling Safety and Environmental Impact

Proj. MA-06-0025

January 1977

Vol. I, Safety, PB 271-047

Vol. II, Environmental Impact, PB 271-048

Construction Monitoring of Soft Ground Tunnels: A Rational Handbook of Practices for Rapid Transit System Planners and Managers

Proj. MA-06-0025

Parsons, Brinckerhoff, Quade and Douglas, Inc.

January 1977, PB 264-361/AS

Study of Subway Station Design and Construction: Final Report

Proj. MA-06-0025

DeLeuw Cather and Company
and Skidmore, Owings and Merrill

March 1977, PB 268-894/AS

Determination of the Optimal Approach to Rail Rapid Transit Car Standardization

Proj. IT-06-0131

International Research and
Technology Corp.

August 1976, PB 259-363/AS

Development of Design Procedures for Stabilized Soil Support Systems for Soft Ground Tunneling

Proj. DC-06-0158

G. W. Clough

Vol. I, A Report on the Practice of Chemical Stabilization Around Soft Ground Tunnels in England, France and Germany,

June 1977, PB 272-771

Vol. II, Preliminary Results,

August 1977, PB 273-064

Vol. III, Analysis and Design Method,

June 1978

Vol. IV, WMATA Case Studies,

October 1978

Case Studies of Building Behavior in Response to Adjacent Excavations

Proj. IL-06-0043

M.D. Boscardin, E.J. Cording,
and T.D. O'Rourke

UMTA-IL-06-0043-78-2

Improved Design Procedures for Tunnel Supports

Proj. MA-06-0025

H.H. Einstein, A.S. Azzovz,
C.W. Schwartz and W. Steiner

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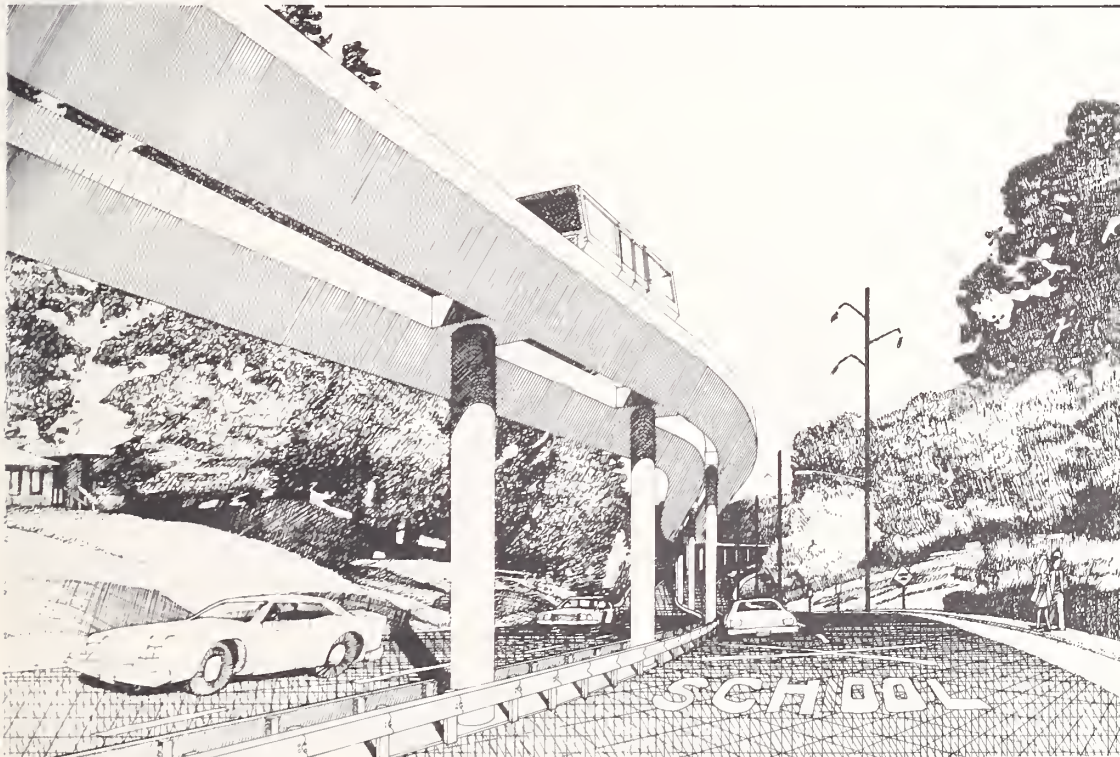
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New Systems and Automation

Trends and Highlights



Transit systems in which automatic vehicles are designed to travel along their own separate guideways are classified as automated guideway transit (AGT) systems. A number of such systems are currently in operation at activity centers across the country, including airports, shopping centers, college campuses, and amusement parks. The Urban Mass Transportation Administration has major programs to develop and also to install automated guideway transit systems.

Automated transit systems provide a means for reducing labor costs and also for providing performance and safety characteristics which compare with rail transit and can compete with the automobile. Present studies indicate that automated systems have a very high potential for affecting the movement of people within cities. When installed in suitable configurations, such systems will provide a level of service significantly superior to that provided by current bus and rail transit. By providing trips with short travel times and few intermediate stops between origin and destination, AGT systems are expected to offer formidable competition to the automobile.

UMTA's overall program in AGT includes these major elements: Automated Guideway Supporting Technology; AGT Socio-Economic Research; Advanced Group Rapid Transit Systems (AGRT); and the Downtown People Mover (DPM). Work in these areas, reported in this chapter and Chapters 5 and 7 below, is highly interrelated. For example, the socio-economic research includes assessments of existing foreign and domestic systems, providing supporting data for the DPM program and providing

performance criteria for more advanced systems and technologies.

A significant accomplishment in the past year was the negotiation of contracts for the development and testing of engineering verification test facilities for an Advanced Group Rapid Transit system. A conference on AGT technology development was held at the U.S. DOT Transportation Systems Center in March 1978, and was attended by more than 250 members of the research and development community.

Advanced Group Rapid Transit

The goal of the AGRT development is the development and installation of engineering verification test facilities which embody the system specifications. The specifications for the AGRT system include achievement of a peak capacity of 14,000 seats per lane per hour using 12-seat vehicles. The use of small vehicles will allow the system to provide a high level of service to dispersed origins and destinations over various urban areas. The system will also be suitable for collection and distribution in central business districts. Trips will be characterized by short waiting and travel times and few intermediate stops



Two preliminary designs of Advanced Group Rapid Transit vehicles are shown, the Boeing concept [top] and the Otis version [bottom].



To increase passenger safety and security, closed-circuit television and voice alarms are being tested on a New York City subway line. Note the camera mounted near the station ceiling [top]. The control room in the transit police headquarters where the video and audio signals are received is shown at bottom.

Phase I, the concept definition phase, was completed in August 1975. During Phase I, three contractors, Boeing, Otis and Rohr, produced competing preliminary designs. Phase IIA (VA-06-0023), (OH-06-0023), (MD-06-0025), (DC-06-0140), (CA-06-0094), (CO-06-0008), (WA-06-0008) and (IT-06-0169), which began in June 1976 and was completed in December 1977, continued the Phase I design competition. The three contractors further developed their designs, conducted development of critical subsystems, and performed extensive simulation studies of the behavior of their systems on a test network provided by UMTA.

The system designed by Boeing utilizes a rubber-tired vehicle steered along a guideway by side-mounted steering wheels which guide both the front and rear axles.

The guideway is U-shaped and is fabricated of reinforced concrete. The vehicles are equipped with a unique radar collision avoidance system. The Boeing version of AGRT is an outgrowth of the Morgantown design.

The Otis Elevator Company system uses a vehicle with an air-cushion suspension system and a single-sided linear induction motor (LIM) propulsion system. The LIM primary is on board the vehicle and the LIM secondary is embedded in the center of the guideway.

Here too, the guideway is an open U-shaped design. The vehicle emergency braking system uses a skid-type brake pad which contacts the guideway surface under emergency conditions.

During Phase IIB, Boeing and Otis will develop engineering prototype systems for

installation at their plants. The test facilities will be capable of testing the significant vehicle operation and control functions. An engineering test program will be used to identify and correct deficiencies.

The development of Romag technology will also be continued, with concentration on subsystem and component development. The development will be carried out by Boeing, which has acquired rights to Romag under license. Romag is a vehicle magnetic suspension concept using magnetic forces between the primary and secondary of a linear induction motor to suspend as well as to propel and brake the vehicle. Magnetic suspension offers significant advantages in the areas of noise and of guideway wear.

Automated Guideway Transit Supporting Technology

The Automated Guideway Transit Supporting Technology program is directed toward the development of technologies that permit the successful deployment of automated guideway transportation systems. Existing elements of this program are directed toward development of analysis, software, subsystems, and components that may be used for a variety of advanced urban transportation systems. New elements will include system-oriented activity.

A major goal of the program is to provide information to system designers and developers. Further goals are to provide information to planners that will assist them in the evaluation of

applications and to reduce the risk involved in the deployment of new systems.

Previous non-system oriented activities addressed to new systems of transportation included the development engineering program and command and control studies performed by the Applied Physics Laboratory (APL) at Johns Hopkins University. The Automated Guideway Transit Supporting Technology program has expanded the scope of these earlier programs and is focused on three areas: system technology, subsystem and component technology, and wayside technology.

At the system technology level, the major thrusts are in the area of system simulations and operational analyses, and development of guidelines and standards. The performance of system-level operational analyses will provide the needed technical and cost data. Use of analytical tools, such as computer simulations, will generate data that will permit local urban planners and government officials to evaluate expected performance characteristics and to identify and project various cost elements of a proposed automated ground transportation system.

The System Operations Studies program (MA-06-0048) is addressing a wide spectrum of different technologies ranging from large vehicle shuttles to Personal Rapid Transit (PRT) systems. Both single and multiple vehicle configurations are being considered.

A complete set of AGT system planning models in the form of computer simulation programs has been developed which permit the user to develop detailed cost and service information for a proposed



This research vehicle receives lateral control signals from a wire imbedded in the road.



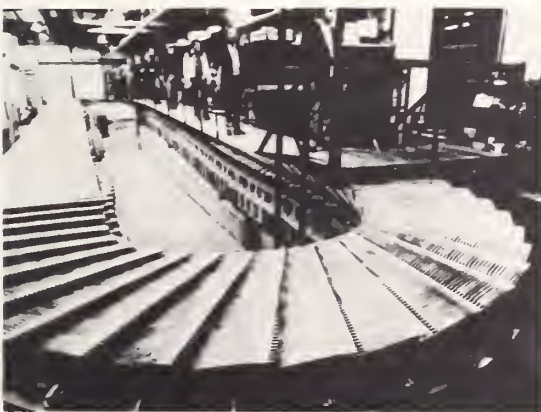
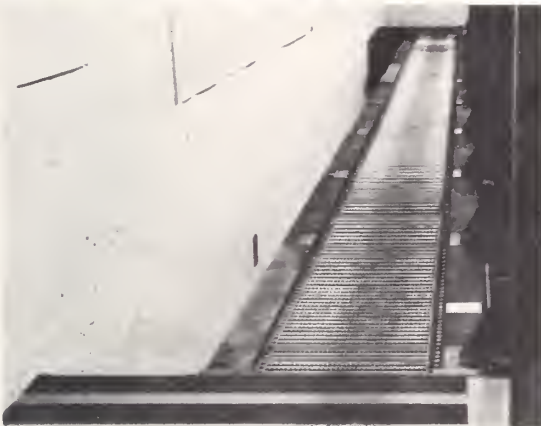
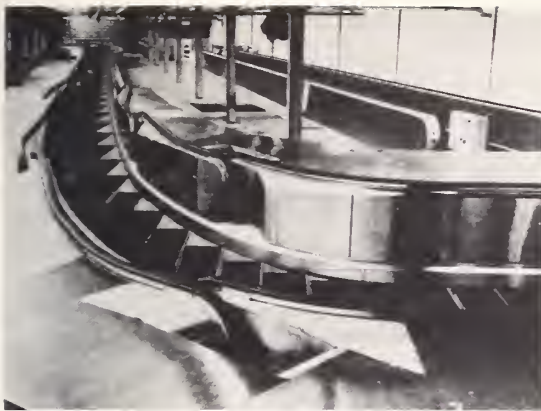
The use of prefabricated guideway sections is being evaluated under the AGT Supporting Technology Program.

AGT deployment starting from zone-to-zone trip demand data, feeder characteristics, station locations and configurations, and network geometry. Analysis fidelity ranges from average traffic flow to detailed representation of individual passengers and vehicles. The models are applicable to all classes of AGT technology and planners in all facets of system operations.

The System Safety and Passenger Security Studies program (MA-06-0048) is being conducted to evaluate various methods of minimizing vandalism and enhancing passenger security and safety in automated systems. Studies are also being conducted to determine design guidelines and requirements for automated systems. Particular emphasis is being placed on user and non-user impacts, and on passenger safety and comfort.

Security and safety enhancement techniques currently employed by transit authorities have been identified and evaluated. Specific emphasis has been given to architectural design, police methods, surveillance techniques, evacuation, rescue, and the values passengers place on security features. A highlight of this project is evaluation of a television surveillance experiment which was carried out in an at-grade station on a New York subway line. In addition, experiments were conducted to establish relations between design and permissible emergency braking levels.

The Subsystem and Component Technology area treats two key technical topics that are common to all AGT systems: vehicle longitudinal control and reliability; and vehicle lateral control and switching.



Illustrated are three prototype accelerating walkways. Although none is yet public use, a demonstration is planned.

The Vehicle Longitudinal Control and Reliability project (IT-06-0148) is concerned with the improvement of performance, reliability, and maintenance of longitudinal systems, with fail-operational design concepts receiving particular attention. Redundant implementation will provide the key to operation that permits vehicles suffering single failures to continue to the nearest maintenance area, station, or siding. Fail-operational design approaches using microprocessors will significantly improve the mean time between failures which might lead to vehicle breakdowns on the guideway. The longitudinal control studies also are exploring the potential of a variety of control approaches including vehicle-follower and point-follower strategies. The longitudinal control system project includes analyses, evaluation, design, and experimental investigations. Extensive testing will include operations at headways less than five seconds.

The Vehicle Lateral Control and Switching project (IT-06-0156) is exploring techniques to improve reliability, reduce costs and improve performance of vehicle electronic wire-follower and mechanical wall-follower lateral control and switching systems. Reducing the guideway length required to execute switching maneuvers and improve ride comfort are two major objectives of this program that include lateral control and switching system design analyses, computer simulations, and vehicle tests at the contractor's facility. A test vehicle has been built and testing has been carried out at the contractor's test track and at Lowry Air Force Base.

All the investigations in the longitudinal and lateral control areas are being related to cost and performance

goals to assure that they reflect practical objectives. The work in this area includes review of the status of existing technology, detailed mathematical modeling, analyses and simulation, development of design concepts, and experimental validation of those designs.

The Wayside Technology area is being addressed through the Guideway and Station Technology project (IT-06-0152). This project includes studies of implementation technologies for guideways, stations, power distribution systems, and weather protection concepts. Reduction of cost, implementation time, and environmental impact of guideways and stations are emphasized.

A comprehensive survey of existing design concepts has been completed. Detailed analysis of existing designs has indicated a number of areas where cost and implementation time can be reduced through the use of double-T beams, prefabrication, etc. The project is developing improved guideway and station designs for AGT vehicles, both small and large.

Design considerations for all-weather vehicle operation, such as guideway heating or protected designs also are being addressed.

In addition to the major projects discussed above, a number of smaller projects are being pursued. A study has been performed to identify measures of service availability as used by operators, manufacturers, and researchers. Projects are also underway in a number of areas such as the development of a hydrostatic drive for AGT vehicles (CA-06-0108); the development of an instrumented vehicle to detect malfunctions for minimizing down

time (WA-06-0009); experimentation and analysis with a single-sided linear induction motor for both suspension and propulsion (VA-06-0035); and automated mixed traffic vehicle technology development (CA-06-0088) concentrating on a small vehicle having sophisticated sensors that permit operation at 2 to 5 kph (1.2 to 3 mph) speeds in pedestrian areas, or higher speeds in semi-protected rights of way.

An innovative moving belt transport system has been installed at the Georgia Institute of Technology (GA-06-0009) to transport students. A detailed assessment of its characteristics is planned.

A number of independent study contracts also have been awarded to assist the UMTA staff in evaluating technical approaches, performing cost analyses, developing new hardware system concepts, and evaluating environmental impacts of AGT systems, (VA-06-0041) and (MD-06-0038).

The data and analytical tools obtained from each program are being documented. As progress is made in the AGTST development program, workshops will be conducted, where appropriate, to disseminate the data to system designers and urban planners. Data evolving from the program will also be applied to a broad spectrum of automated guideway technologies ranging from simple shuttles to network applications. It is anticipated that some of the results will change the scope and nature of tasks and the correlation between tasks.

The technical results of the AGTST program will be an important factor in decreasing the technical and economic risks associated with the development and installation of AGT systems, including the

AGRT systems and the Downtown People Mover.

Accelerating Walkways

Accelerating Walkways (IT-06-0126) are novel pedestrian-assist devices capable of providing a valuable connector service within activity centers such as transit terminals, shopping centers, and central business districts. A typical accelerating walkway moves at something less than normal walking speed for boarding and unloading but increases to more than twice the normal walking speed for the main portion of the trip. Accelerating walkways compare favorably in both cost and travel time with vehicular travel.

Several prototype systems have been developed, but none provide service to the public. Feasibility studies have been concluded and are favorable from both cost and benefit considerations. The studies indicate that safety will be comparable to that of existing moving sidewalks and escalators.

In the next phase, two or more manufacturers will be awarded contracts to design and study the implementation of their designs for a 300-foot walkway application in a railroad terminal. It is planned to follow this activity by a hardware testing phase and, ultimately, by a public demonstration of one system.

New Systems and Automation

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
ADVANCED GROUP RAPID TRANSIT SYSTEMS					
Phase IIA Design	CA-06-0094 CO-06-0008 WA-06-0008	\$4,200,000	June 1976- Dec. 1977	Boeing Aerospace; Otis Elevator Co.; Rohr Industries	Aldo DeSimone (202) 426-9264
Phase IIA Technical Studies	VA-06-0023 OH-06-0023 MD-06-0025 DC-06-0142	\$730,000	June 1976- Dec. 1977	MITRE Corp.; Battelle Columbus Laboratory; Johns Hopkins University; American Public Transit Association	James Hamm (202) 426-9265
Phase II Availability Analysis	IT-06-0169	\$50,000	April 1976- Dec. 1978	Frank C. Smith and Associates	Raymond Brunson (202) 426-9264
Pre-Phase IIB Technical Studies	MD-06-0025 IT-06-0190 IT-06-0186	\$3,000,000	Oct. 1978- Jan. 1983	MITRE Corp.; Battelle Columbus Laboratory; Johns Hopkins University	James Hamm (202) 426-9265
AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY					
Development of Measures of Service Availability	MA-06-0048	\$99,000	Oct. 1976- Jan. 1979	Battelle Columbus Laboratory	C.W. Watt (617) 494-2298
AGT System Opera- tions Studies	MA-06-0048	\$3,683,000	June 1976- June 1979	TSC; General Motors Corp.; IBM Corp.	Arthur Priver (617) 494-2357
AGT System Safety and Passenger Security	MA-06-0048	\$588,000	Feb. 1977- Feb. 1979	TSC; Dunlap and Associates; University of Virginia; Vought Corp.	E.D. Sussman (617) 494-2041
AGT Vehicle Longitu- dinal Control and Reliability	IT-06-0148	\$2,561,000	March 1977- Sept. 1979	Otis Elevator Co.	Robert Hoyler (202) 426-9264
AGT Vehicle Lateral Control and Switching	IT-06-0150	\$869,000	Aug. 1977- Aug. 1979	Otis Elevator Co.	George Izumi (202) 426-4047

New Systems and Automation

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY					
AGT Hydrostatic Drive Studies	CA-06-0108	\$25,000	Sept. 1977- Sept. 1978	Mobility Systems	Robert Hoyler (202) 426-9264
AGT Independent Studies	VA-06-0041	\$460,000	Jan. 1977- Jan. 1979	MITRE Corp.	George Izumi (202) 426-4047
Independent PRT Studies	CA-06-0091	\$177,000	Sept. 1976- Jan. 1978	Aerospace Corp.	Robert Hoyler (202) 426-9264
AGT Independent Control Studies	MD-06-0038	\$250,000	March 1978- March 1979	Johns Hopkins Univ., Applied Physics Laboratory	Robert Hoyler (202) 426-9264
AGT Platooning and Entrainment	MA-06-0085	\$25,000	Feb. 1978- Oct. 1978	Massachusetts Institute of Technology	Robert Hoyler (202) 426-9264
VDAS Failure Monitoring	WA-06-0009	\$70,000	Aug. 1977- March 1979	Port of Seattle, Wash.	Robert Hoyler (202) 426-9264
AGT Guideway and Station Technology	IT-06-0152	\$1,000,000	July 1977- Aug. 1979	DeLeuw Cather and Co.	George Izumi (202) 426-4047
AMTV Technical Development	CA-06-0088	\$205,000	Feb. 1976- Oct. 1979	California Institute of Technology	Robert Hoyler (202) 426-9264
Non-Contact Suspension Technology: Magnetic Levitation	VA-06-0035	\$409,000	June 1976- Dec. 1978	MITRE Corp.	Robert Ravera (202) 426-0190
Engineering Modification and Test of Transette	GA-06-0009	\$200,000	May 1978- July 1979	Georgia Tech University	George Anagnostopolous (617) 494-2758

New Systems and Automation

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
ACCELERATING WALKWAY PROGRAM					
Accelerating Walkways	IT-06-0126	\$5,748,000	Aug. 1976- Sept. 1983	Tri-State Regional Planning Commission; Port Authority of New York and New Jersey	George Izumi (202) 426-4047

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This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS may not have been published in sufficient quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

Advanced Group Rapid Transit System Development Program, Phase IIA:

Executive Summary

Proj. CA-06-0094
Rohr Industries, Inc.

Advanced Group Rapid Transit System Development Program, Phase IIA:

Executive Summary

Proj. CO-06-0008
Otis Elevator Company

Advanced Group Rapid Transit System Development Program, Phase IIA:

Executive Summary

Proj. WA-06-0008
Boeing Aerospace Company

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Proj. CA-06-0088
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Jet Propulsion Laboratory
December 1976, PB 264-527/AS

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Proj. CA-06-0088
California Institute of Technology,
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February 1978, N78-25257

Costs and Energy Efficiency of a Dual-Mode System

Proj. CA-06-0088
California Institute of Technology,
Jet Propulsion Laboratory
April 1977, PB 272-714/AS

Point-Follower Automatic Vehicle Control: A Generic Analysis

Proj. MD-06-0022
Johns Hopkins University, Applied Physics
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A State-Constrained Approach to Vehicle-Follow Control for Short-Headway

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Proj. MD-06-0022
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Proj. VA-06-0025
MITRE Corporation
July 1976, PB 263-640/AS

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Proj. VA-06-0025
MITRE Corporation
August 1976, PB 262-480/AS

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Proj. CA-06-0078
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Proj. CA-06-0090
General Research Corporation
February 1976, PB 259-529/AS

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Proj. CO-06-0007
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Network Model Studies for Automated Guideway Transit: Advanced Group Rapid Transit Models
Proj. MD-06-0018

Johns Hopkins University, Applied Physics Laboratory
February 1976, PB 251-881/AS

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Proj. MD-06-0018
Johns Hopkins University, Applied Physics Laboratory
March 1976, PB 251-930/AS

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Proj. MD-06-0018
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Proj. CA-06-0071
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Proj. MA-06-0048
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October 1977, PB 284-653/AS

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C. W. Watt (editor)
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February 1978, PB 282-295/AS

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Proj. VA-06-0041

MITRE Corp.

May 1978

AGT Conference Proceedings

Proj. MA-06-0048

August 1978, UMTA-MA-06-0048-78-1

Automated Guideway Transit [AGT] Applications

Trends and Highlights



Automated Guideway Transit (AGT) systems, or people movers, are being considered as a promising alternative to conventional transit systems in urban areas. Fully automated transit systems are being developed to provide safe, efficient, and economical transportation in our central cities in response to a number of concerns. Among these are the trend toward the revitalization of our central cities; the need for improvements in transit productivity and service levels; the need for energy conservation; and the need for reductions in traffic congestion and air pollution.

Although people movers are presently carrying millions of passengers at airports, universities, recreational parks, and shopping centers, their application in more complex urban settings poses special environmental, economic, technical, and institutional problems.

The Office of AGT Applications was established as a focal point to coordinate the introduction of people mover systems into the urban environment. The office has three major objectives: 1) to develop and implement projects that can demonstrate the application of AGT systems in urban areas; 2) to provide a "delivery system" for the deployment of federal and privately developed advanced technology systems that have demonstrated promise in providing improved transit service; and 3) to provide the necessary planning, technical, and managerial support to local, state, and other departmental offices involved with the implementation of AGT systems in urban applications.

Downtown People Mover [DPM] Program

Through the Downtown People Mover (DPM) program, the Office of AGT Applications is attempting to show that fully automated, relatively simple people mover systems, operating in urban environments, can provide an adequate level of reliable service at reasonable costs.

In April 1976, proposals for DPM projects were solicited nationwide. Of the 68 cities that responded with letters of interest, only 38 were able to submit proposals. Four of these — Cleveland, Ohio; Houston, Tex.; Los Angeles, Calif.; and St. Paul, Minn. — were selected as demonstration sites. In addition, the Department of Transportation advised the cities of Baltimore, Miami, and Detroit that their DPM proposals were of sufficient merit to permit the funding of their proposed systems by diverting their existing federal transit commitments, if the cities so desired.

Subsequently, in June 1977, Congress advised that in addition to these selected cities, UMTA should consider funding additional DPM projects in the cities of Jacksonville, Fla.; St. Louis, Mo.; Baltimore, Md.; and Indianapolis, Ind. Upon further review of the merits of the finalists' proposals, the department determined that Baltimore, Indianapolis, Jacksonville, Norfolk (Va.), and St. Louis could be awarded technical study grants to perform feasibility studies to further refine their proposed projects.

After reviewing local priorities, Baltimore decided that it did not want to use existing transit commitments for its DPM and elected to proceed with the

feasibility study. Subsequently, Cleveland elected not to participate in the program.

Further refinement of the program has resulted in the establishment of a two-tiered effort, with five cities in each tier. The department's policy with regard to present and future DPM investments is as follows.

The first-tier cities of Los Angeles, St. Paul, Houston, Detroit, and Miami have been awarded capital grants to conduct

their Phase I DPM efforts, that is, preliminary engineering. The award of a Section 3 capital grant to any of these cities for Phase II, project construction, will depend upon the following factors: 1) the availability of federal funds; 2) satisfactory cost and project viability results from the preliminary engineering efforts of that city; 3) the successful completion of all grant statutory requirements by that city, including securing the 20 percent local



Here is an example of how a DPM system might fit into the Los Angeles landscape.

share and obtaining all of the required environmental clearances; and 4) meeting any specific conditions required by UMTA as a prerequisite to participate in the DPM program.

The second-tier cities of Baltimore, Indianapolis, Jacksonville, Norfolk, and St. Louis have been awarded technical studies grants to conduct feasibility studies and to further refine their DPM projects. If the results of these technical studies so warrant, grants for Phase I, preliminary engineering, may be awarded if sufficient federal funds are available and if the merits of the applications meet UMTA's priorities and satisfy all statutory requirements. The award of capital grants for Phase II, project construction, will be subject to the same constraints established for the first-tier cities. However, construction will commence only upon successful deployment and operation of one or more of the first-tier cities.

Any other city seeking federal funding of a DPM system would be required by UMTA to conduct an analysis of transportation alternatives prior to any submission of an application for capital grant assistance.

Downtown People Mover Preliminary Engineering (PE) Grants

In Los Angeles, plans are being made to revitalize the Central Business District (CBD), reinforce downtown growth trends, and stimulate the local economy by initiating the following actions: 1) implementation of coordinated land use and transportation programs; 2) provision of joint development and redevelopment opportunities around DPM stations; 3) improvement of CBD circulation with connections to the elevated pedestrian



This architectural model shows a preliminary DPM design for St. Paul, Minn. Here, the DPM enters and makes a loop through a proposed new building complex.

PEDWAY network; 4) provision of intercepts to reduce CBD auto use; 5) improvement of air quality; and 6) improvement of services and accessibility to downtown for transit users.

Los Angeles was awarded preliminary engineering grants (CA-03-0131, CA-06-0112, CA-09-7002, CA-09-7003) and initiated work on its DPM project in January 1978. The final route alignment and station locations were selected to optimize new joint development opportunities and to lessen potential adverse environmental impacts. Preliminary engineering design of the guideway and stations was performed for the selected alignment. UMTA reviewed the Preliminary Safety Plan, elderly and handicapped provisions, and the Draft Environmental Impact Review (DEIR) in September 1978. A draft System Specification, estimates of the capital and operation and maintenance costs, and a financial plan were submitted in October 1978.

The main objective of St. Paul's proposed DPM system is to improve accessibility to the CBD, improve the internal circulation system, discourage the use of automobiles in the CBD, complement the existing elevated pedestrian SKYWAY network, encourage fringe parking, and improve air quality.

St. Paul was awarded its preliminary engineering grants (MN-03-0017, MN-06-0009, MN-09-0024) and work was initiated in September 1977. Base patronage forecasts were completed in March 1978, and preliminary route alignments and station locations were determined by April 1978. Parking plans, station layouts, AGT supplier liaison, cost



The AIRTRANS Urban Technology Program is working to make the technologies of a successful airport transit system more suitable for urban use.

estimates, joint development studies, the preparation of a draft procurement bid package, and environmental impact studies were among the tasks completed during the PE phase. In August 1978, a final route alignment was defined and an economic development forecast was completed. In September, final capital cost estimates for the selected DPM system were released. The preliminary system specifications and the financial plan were completed in late 1978.

Houston's proposed DPM is expected to improve downtown mobility for commuters, CBD employees, shoppers, and visitors; to increase transit ridership

both within the CBD and system-wide; to contribute to the vitality of the downtown area and Houston as a whole; and to decrease automobile use in the CBD.

The City of Houston was awarded preliminary engineering grants (TX-03-0035, TX-06-0024, TX-09-0088) in December 1977. The city postponed the start of the DPM project, however, until after August 12, 1978, when Houston area voters approved a region-wide mass transit plan that established the Metropolitan Transit Authority (MTA). Establishment of this transit authority shifted the responsibility for all public transportation in the Houston metropolitan area from the

City of Houston to the MTA.

During the latter part of 1978, the MTA strived to fulfill the labor, legal, and Minority Business Enterprise (MBE) requirements that were necessary for transferring existing UMTA grants from the City of Houston to the MTA. These requirements were approved by UMTA in December 1978, and the MTA started their 15-month DPM preliminary engineering phase in February 1979.

The specific local objective of Detroit's proposed DPM system is to revitalize the CBD by linking the modern centers of the city (the expanding Renaissance Center, Cobo Hall, the River Front Arena, the Kern Block proposal, and Woodward Mall) with declining office and retail establishments in the CBD core.

In June 1978, Detroit was awarded its preliminary engineering grants (MI-03-0063, MI-09-0038, MI-09-0039), and preliminary engineering and environmental impact studies commenced in September 1978. Four DPM route alignments have been selected for further study, and from these a final preferred DPM route alignment will be selected. A preliminary review of the DPM System Design Criteria has been accomplished. The completion of the preliminary engineering phase is scheduled for February 1980.

The City of Miami hopes to maintain and strengthen its downtown area as the principal activity center of the region, to stimulate CBD development and mass transit use, to reduce traffic congestion, and to increase accessibility to downtown facilities. Dade County hopes that the proposed DPM will further act as a catalyst to the economic development of the downtown Miami area. The Miami DPM

will be coordinated with the rapid transit system and will act as a circulator and distributor in the downtown area.

UMTA awarded DPM preliminary engineering grants to Dade County, Fla. (FL-03-0050, FL-09-7002) in May 1978. Dade County has estimated that about \$24 million can be diverted from its rapid rail project to implement a functional first stage DPM based on an alignment similar to the 1976 Miami DPM route proposal. Preliminary engineering on this first stage DPM system started in mid-November 1978 and is expected to be completed in 15 months.

Downtown People Mover Technical Support

The Downtown People Mover Technical Support Program is designed to assist the Office of AGT Applications in reviewing documentation prepared by the grantees during the preliminary engineering phase. The major objective of these technical support projects is to provide independent review and recommendations to UMTA about each city's DPM preliminary engineering activities. These efforts include a review of performance specifications, capital costs, operation and maintenance costs, project schedules, safety plans, elderly and handicapped provisions, and procurement bid packages. Evaluations of proposed operating strategies, operating and maintenance plans, and testing of the system are also performed.

The Transportation Systems Center (TSC) provides overall DPM program support by reviewing and evaluating assigned elements of the cities' preliminary engineering efforts, assessing the potential

suppliers' technology status, and developing DPM guidelines and evaluation criteria. Dynatrend, Inc. is providing technical support for the cities of St. Paul (IT-06-0182) and Detroit (IT-06-0183); Mobility Systems is providing support for Houston (IT-06-0180); and F. R. Harris is providing support for Los Angeles (IT-06-0181) and Miami (IT-06-0214).

Downtown People Mover Technical Feasibility Studies

Funds for technical feasibility studies were provided to the second-tier cities of Baltimore (MD-09-0014), Indianapolis (IN-09-0017), Jacksonville (FL-09-7001), Norfolk (VA-09-0035), and St. Louis (MO-09-0014). The major objective of these studies is to determine whether a Downtown People Mover would be suitable and practical for these cities. Each study will perform an impact analysis, a preliminary environmental study, and other tasks such as data collection, in order to determine the feasibility of a DPM in each city.

Other Projects Relating to Downtown People Mover Systems

As the DPM program has progressed, the need for proven winter operating capability has been identified as a common requirement to meet the performance specifications of DPM systems in northern cities. Government-funded efforts on the Morgantown and AIRTRANS systems have helped to overcome these systems' deficiencies in this area. The DEMAG/MBB "Cabinlift" system's design inherently provides for winter operating

capability. There is, however, little data available on the impact of winter weather conditions on other DPM candidate systems.

To provide an adequate data base to support DPM planning and decision-making, UMTA has undertaken the Winterization Program (MA-06-0081) with TSC and three suppliers of varying technology systems. The three suppliers involved — Otis, Westinghouse, and Universal Mobility — will perform winter operation testing on their respective systems to characterize the effect of severe weather. Various winterization approaches will be tested to determine their efficiency in alleviating the operating problems associated with severe weather. In addition to providing UMTA with the necessary data base, these tests will permit the suppliers to independently develop or modify their systems to effectively combat winter weather problems.

The Downtown People Mover Communications project (IT-06-0216) will produce two 16mm color films with sound to document the preliminary engineering and implementation phases of UMTA's DPM program. The Office of AGT Applications will act as technical advisor, and the Office of the Secretary will act as production supervisor for these films.

The DPM Maintenance Guideline Development program (VA-06-0055) is developing maintenance guidelines for DPM systems. These guidelines are based upon past AGT experience at the Morgantown People Mover (MPM), AIRTRANS at the Dallas-Fort Worth Airport, and Sea-Tac at the Seattle-Tacoma Airport, and will provide recommendations for the technical and

managerial requirements of DPM maintenance facilities.

The major objective of the Flammability Studies of Materials Used in DPMs (MD-06-0035) is to develop DPM vehicle fire safety guidelines. The guidelines will cover the areas of material flammability and vehicle construction, fire detection and suppression, and emergency egress from vehicles.

Morgantown People Mover [MPM] Demonstration Project

The Morgantown, W. Va., people mover system is an automated, self-service transit system consisting of a fleet of electrically powered vehicles which operate on a guideway at 15-second intervals, either scheduled or on demand. The system provides a safe, comfortable, and reliable means of transportation, while alleviating congestion, noise, and air pollution. The system is capable of transporting 1,100 passengers in 20 minutes between two stations 1.5 miles apart. It can operate 24 hours a day and provides nonstop origin-to-destination service by the use of off-line stations. The vehicles were designed to provide economical service during both peak and low demand periods.

The Morgantown vehicles are small by mass transit standards, each carrying up to 21 passengers, with eight seated and 13 standing. The vehicle is 15.5 feet long and six feet wide and weighs 8,600 pounds when empty. Speeds of up to 30 miles per hour are provided by a DC motor powered by a three-phase, 575-volt AC distribution

system. Rubber tires and an air-bag suspension system provide a quiet and comfortable ride. Unique features include a heated guideway for operation during icy conditions, onboard switching and steering, a synchronous point-follower control system, and computers to manage all system operations. Fail-safe design and redundant safety-critical systems enhance reliability and insure passenger safety.

Compared with conventional transit systems, the Morgantown system provides increased frequency of service and demand-responsive flexibility. The transportation technology that has been developed for Morgantown will also be applicable to the transportation problems of urban core areas. In addition, such systems are also capable of being integrated with existing transit systems.

The Morgantown system has been regarded as a success since its opening for regular revenue service for West Virginia University students in October 1975. It has demonstrated its reliability and its acceptability as a modern transit alternative to increasing automobile use in a high density urban corridor. During its first year of operation, the MPM registered a total of almost 600,000 vehicle miles and almost 800,000 passengers.

Improvements made during the first year of operation resulted in significantly greater reliability and ridership. During its second year of operation, the MPM carried more than 1.85 million passengers and operated almost 600,000 vehicle miles. In September 1977, the system carried 308,000 passengers; average system availability was 97.9 percent. Perhaps most importantly, there have been no serious passenger injuries associated with the

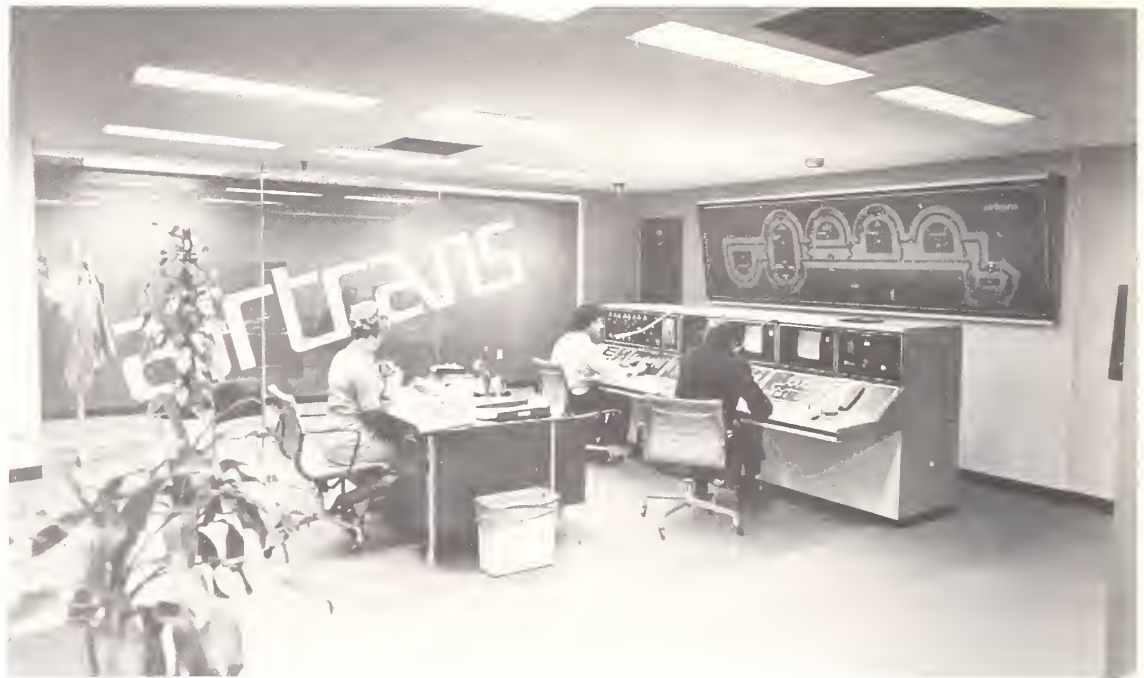
system's operation during the three years since it opened.

Since the system has demonstrated compliance with its specifications and has been accepted by the university, UMTA has approved grants to the West Virginia Board of Regents for the Phase II expansion (WV-03-0006, WV-06-0005, WV-06-0006). Phase II will extend the system another 1.1 miles, add two and one-half new stations, 28 cars, and a small maintenance facility. The existing vehicle fleet will be refurbished, and a new heated power rail will be installed to complement the heated guideway for better winter operations. Phase II construction was completed in late 1978. System operations were halted in July 1978 in order to combine the system extension with the existing system. Operations are scheduled to resume early in the summer of 1979.

The knowledge gained from building and operating the MPM system will be of enormous help in making future automated guideway transit systems more reliable. The MPM has paved the way for things to come, demonstrating the technological feasibility, operational practicality, and transportation benefits of AGT concepts for the future.

AIRTRANS Urban Technology Program

At the Dallas-Fort Worth (DFW) Airport, the AIRTRANS AGT system transports passengers and employees between parking lots and airline terminals. The fully automatic system operates a fleet of 68 vehicles 24 hours a day, serving 53 stations connected by 13 miles of guideway. AIRTRANS also operates utility



The location and speed of all AIRTRANS vehicles are monitored in the control center.

vehicles for baggage, supplies, mail, and refuse between utility stations.

Since its opening in January 1974, AIRTRANS' operational performance has steadily improved. During its first five years of operation, it has carried over 22 million riders and travelled 16 million vehicle miles without any passenger fatalities.

In 1975, an intensive assessment study of AIRTRANS was sponsored by UMTA and performed by the Transportation Systems Center. The study identified a number of areas where further technical development would be necessary to make AIRTRANS suitable for urban application.

In 1976, Congress also expressed a growing interest in applying AGT systems to urban areas in order to help solve urban transportation problems. Since airports represent a different environment than that of urban areas, the AIRTRANS Urban Technology Program (AUTP) was designed to improve the technology of AIRTRANS to be more suitable for urban use. The principal objectives of AUTP include development and demonstration of higher speeds for increased productivity, higher subsystem reliability, and lower capital and operating costs. The project involves two phases.

Phase I of the program covered the period from December 1976 through December 1977. During this phase, an AIRTRANS utility vehicle was converted to a test vehicle and instrumented for test purposes. Measurements were made and tests performed on a portion of the AIRTRANS system guideway at speeds of up to 30 miles per hour to characterize the present vehicle and other subsystems. The analysis of the data was used to support the design of upgraded subsystems including vehicle control electronics, mechanical and servo-actuated steering, and collectors for wayside power and control signals.

A vehicle propulsion system providing speeds of up to 45 miles per hour and a propulsion control system with regenerative braking to reduce energy consumption and extend brake lining life

have been developed. Under Phase I, improved propulsion, steering, power and signal collectors, and control electronics were developed. These improved subsystems were installed in a test vehicle for evaluation and demonstration on the AIRTRANS system in November 1977.

The Phase II program (TX-06-0020) is a 24-month effort building on the results of Phase I. During Phase II, severe winter weather testing of the driveline, suspension, steering, pneumatic system, and electrical system has been conducted using an environmental chamber. Testing also included spraying water at very low temperatures on the power collector/power rail system installed on the rotating 18-foot test wheel to evaluate its performance under icing and freezing conditions. The vehicle control electronics and software have been revised to give

smoother acceleration and to use regeneration for normal braking. In addition, automatic reversing has been developed and demonstrated.

All of the improved elements and subsystems are being installed into a modified AIRTRANS utility vehicle to constitute a prototype urban vehicle. Nearly 80 percent of the design has been completed and most of the hardware has been ordered, including an automatic mechanical coupler system. After the prototype is completed, its performance and improved features will be evaluated during an operational demonstration on the AIRTRANS system during the summer of 1979. It is hoped that these improvements in the AIRTRANS vehicle will provide the technological building block for future urban AIRTRANS systems.

Automated Guideway Transit [AGT] Applications

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
DOWNTOWN PEOPLE MOVER [DPM] PROGRAM					
Downtown People Mover Preliminary Engineering Grants	CA-03-0131	\$1,478,000	Jan. 1978-	City of Los Angeles, Calif.	Vincent R. Demarco (202) 426-2896
	CA-06-0112	\$488,000	Oct. 1979		
	CA-09-7002	\$20,000			
	CA-09-7003	\$365,000			
	MN-03-0017	\$1,068,000	Sept. 1977-	City of St. Paul, Minn.	John J. Marino (202) 426-2896
	MN-06-0009	\$265,000	Dec. 1978		
	MN-09-0024	\$359,000			
	TX-03-0035	\$762,000	Dec. 1978-	City of Houston, Tex.	Fred L. Sing (202) 426-2896
	TX-06-0024	\$172,000	March 1980		
	TX-09-0088	\$188,000			
	MI-03-0063	\$950,000	June 1978-	City of Detroit, Mich.	Steve Asatoorian (202) 426-2896
	MI-09-0038	\$224,975	March 1980		
	MI-09-0039	\$33,694			
	FL-03-0050	\$964,000	May 1978-	City of Miami, Fla.	William Murray (202) 426-2896
	FL-09-7002	\$210,000	March 1980		
Downtown People Mover Technical Support	MA-06-0081	\$1,355,000	June 1977- Sept. 1979	TSC	John J. Marino (202) 426-2896
	VA-06-0037	\$450,000	April 1976- Dec. 1979	MITRE Corp.	John J. Marino (202) 426-2896
	IT-06-0182	\$339,000	Jan. 1978- Dec. 1978	Dynatrend, Inc.	John J. Marino (202) 426-2896
	IT-06-0183	\$285,000	Sept. 1978- Dec. 1979	Dynatrend, Inc.	Steve Asatoorian (202) 426-2896
	IT-06-0180	\$219,000	Dec. 1978- March 1980	Mobility Systems	Fred L. Sing (202) 426-2896
	IT-06-0181	\$340,000	Jan. 1978- Oct. 1979	F. R. Harris	Vincent R. DeMarco (202) 426-2896

Automated Guideway Transit [AGT] Applications

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
DOWNTOWN PEOPLE MOVER [DPM] PROGRAM					
	IT-06-0214	\$253,000	Nov. 1978- Dec. 1979	F. R. Harris	William Murray (202) 426-2896
Downtown People Mover Technical Feasibility Studies	MD-09-0014	\$241,000	Sept. 1978- Dec. 1979	City of Baltimore, Md.	Fred L. Sing (202) 426-2896
	IN-09-0017	\$200,000	April 1977- Dec. 1979	City of Indianapolis, Ind.	David B. Tuttle (202) 426-2896
	FL-09-7001	\$368,000	May 1978- June 1979	City of Jacksonville, Fla.	William Murray (202) 426-2896
	VA-09-0035	\$100,000	July 1978- Nov. 1979	City of Norfolk, Va.	John J. Marino (202) 426-2896
	MO-09-0014	\$160,000	July 1978- Nov. 1979	City of St. Louis, Mo.	Fred L. Sing (202) 426-2896
OTHER PROJECTS RELATING TO DOWNTOWN PEOPLE MOVER SYSTEMS					
DPM Winterization Program	MA-06-0081	\$900,000	Sept. 1978- May 1979	TSC	Philip Morgan (202) 426-2896
Downtown People Mover Communications	IT-06-0216	\$310,000	Sept. 1978- Dec. 1984	To be selected	Fred L. Sing (202) 426-2896
DPM Maintenance Guide- line Development	VA-06-0055	\$49,143	Nov. 1978- July 1979	Transportation Research and Analysis Corp.	William Murray (202) 426-2896
Flammability Studies of Materials Used in DPMs	MD-06-0035	\$20,000	Aug. 1977- Aug. 1978	DOT; National Bureau of Standards	William Rhine (202) 426-9545

Automated Guideway Transit [AGT] Applications

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
MORGANTOWN PEOPLE MOVER [MPM] DEMONSTRATION PROJECT					
Morgantown People Mover System: Phase II	WV-03-0006 WV-06-0005 WV-06-0006	\$63,600,000	Oct. 1976- April 1980	West Virginia Board of Regents (WVBOR)	John J. Marino Philip Morgan (202) 426-2896
AIRTRANS URBAN TECHNOLOGY PROGRAM					
AIRTRANS Upgrading	TX-06-0020	\$7,000,000	Dec. 1976- Dec. 1979	Dallas-Fort Worth Airport, Tex.	John J. Marino (202) 426-2896

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS may not have been published in sufficient quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For

information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

AIRTRANS Urban Technology Program, Phase I: Final Report

Proj. TX-06-0020
Vought Corporation
January 1978, PB 291-128

Impact Evaluation of Morgantown PRT 1975- 1976 Ridership, Interim Analysis

Proj. MA-06-0026
Transportation Systems Center
June 1977, PB 270-916

MPRT O & M Phase Operating, Availability and Maintenance History

Proj. WV-06-0005
Boeing Aerospace Company
Surface Transportation Systems
January 1977, PB 266-994/AS

People Mover Profile

Proj. MA-06-0081
Urban Mass Transportation Administration
May 1977, PB 268-335/AS

PRT Impact Study, Pre-PRT Phase

Proj. MA-06-0026
West Virginia University
March, 1976
Vol. I, Travel Analysis, PB 254-481/AS
Vol. II, Data Collection Procedure and Coding
Manual, PB 254-482/AS
Vol. III, Frequency Tabulations from Four
Transportation-Related Surveys,
PB 254-483/AS

Proceedings of the First DPM Workshop, "Project Management Control," April 30- May 2, 1978

UMTA and West Virginia University

**Technical Evaluation of DPM City System
Requirements**

Proj. VA-06-0037

MITRE Corporation

October 1978, UMTA-VA-06-0037-78-1

DPM GUIDELINE DOCUMENTS

DPM Program Plan

UTD Document Control Number 76-08

Revision 03

May 21, 1976

DPM Program Implementation Guidelines

UTD Document Control Number 77-10

Revision 01

March 14, 1977

DPM Program Implementation Guidelines:

**Amendment to Include "Multiple
Technologies Statement"**

UTD Document Control Number 77-10

Revision 02

December 9, 1977

DPM Program Implementation Guidelines:

Appendix C,

Guidelines for DPM System Design

Safety and Product Qualification

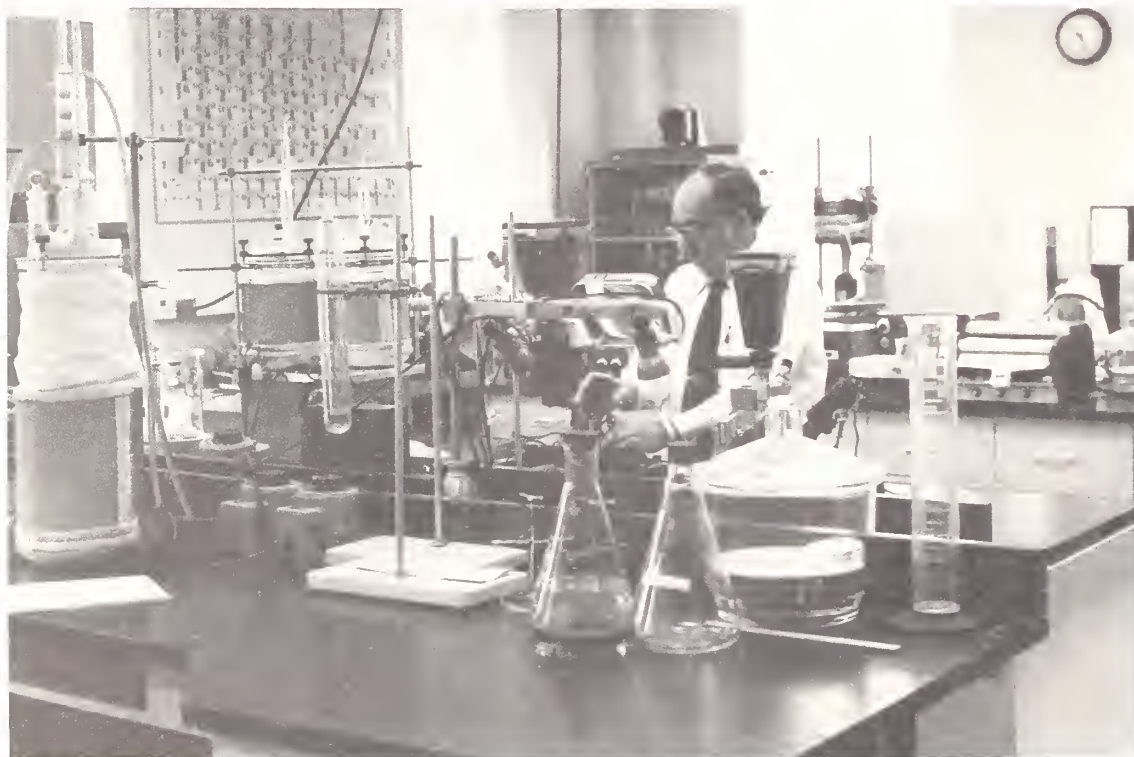
Trends and Highlights

In 1976 UMTA established the Office of Safety and Product Qualification to insure increased emphasis on the safety, quality, operational suitability, and reliability of UMTA funded transit systems. The activities of the office are divided into two major program areas: safety and product qualification.

The safety program has to date emphasized voluntary initiatives on the part of new transit systems in implementing safety and system assurance programs. Close monitoring of these programs is carried out by UMTA with the support of other organizations, such as the Transportation Systems Center (TSC), the Federal Railroad Administration (FRA) and the American Public Transit Association (APTA). The office sponsors educational programs in safety and system assurance, as well as research on safety and reliability problems, with the aim of increasing general knowledge among transit operators and other transit professionals.

A significant change occurred in UMTA's safety program in 1978. As the result of a DOT study, UMTA was given complete responsibility for rapid rail and light rail transit system safety. The responsibility for rapid rail systems had formerly resided with the FRA, while no administration had specific responsibility for light rail transit safety. The restructuring required by this shift in responsibility will not be completed until FY 80.

The product qualification program is directed toward improvements in the products and practices of the transit supply industry. The functions of the office in this program area are similar to those of a product assurance office in private industry.



Some of the major product qualification efforts involve developing design and technical standards, facilitating information exchange among designers, builders and operators, and improving UMTA policies to bring about acquisition of better transit equipment and better systems operations.

Some projects relating to safety and product qualification are being conducted by other offices within UMTA, but are coordinated with the overall safety and product qualification program. A number of these projects are currently being placed within the Office of Safety and Product Qualification.

In FY 78 the Office of Safety and Product Qualification made particular progress in the area of fire safety research; in the development of procurement specifications for Section 16 (b) 2 of the Urban Mass Transportation Act, which will insure the purchase of quality vehicles used for the transportation of the elderly and handicapped; and in the development of a Rail Transit Safety Program Plan.

Development of a Safety Program Plan

A recent DOT study recommended the transfer of responsibility for rail safety from the FRA to UMTA. The study further recommended that UMTA develop a rail transit safety program plan, including a new rapid rail transit accident/incident reporting system. Prior to this study, the Office of Safety and Product Qualification had been engaged in the development of a Safety Program Plan for all transit modes. In support of this effort, the Institute of Safety and Systems Management (ISSM)

at the University of Southern California undertook a project (CA-06-0105) to assess critical safety issues in rail and bus transit and to provide information to aid in the assessment of existing transit accident reporting systems. Specific recommendations coming out of this project were used to aid in developing the Rail Transit Safety Program Plan. An additional task under the ISSM study was the investigation of criteria and procedures used for determining "unsafe" conditions in mass transit facilities, equipment and operations. A final report on this "unsafe" conditions task will be available in 1979.

Safety and Product Qualification Training Program

One of UMTA's goals in the area of safety and product qualification is to disseminate pertinent information to individuals working in the field of mass transit. Under an ongoing contract (DC-06-0215), the Transportation Safety Institute (TSI), located in Oklahoma City, Okla., assists UMTA in planning and conducting safety and system assurance courses for transit operators, suppliers, consultants, government officials and others working in the field. In FY 78 the following courses were offered through TSI.

- A reliability, maintainability, availability and dependability course
- A system security course
- A system safety and quality assurance course
- A one-day seminar on safety and

system assurance attended by New York City Transit Authority executives

A three-day seminar on safety and system assurance, attended by New York City Transit Authority managers

The system security course, initiated in FY 78, proved very successful and two additional seminars, "Mass Transit Security" and "Mass Transit Explosives Security Management," are planned for FY 79.

Further information on the safety and system assurance training courses, including brochures, may be obtained from Robert F. Creson, Director, Transportation Safety Institute, Department of Transportation, 8500 South MacArthur Blvd., Oklahoma City, Okla. 73125.

System Safety and System Assurance Support

Under a continuing contract (DC-06-0123), the American Public Transit Association (APTA) supports UMTA's Safety and Product Qualification Program by gathering information and providing technical expertise on transit safety issues. This contract has the advantage of insuring the participation of the transit industry in UMTA's safety and product qualification program and allows UMTA to draw on the expertise of transit managers.

During FY 78 APTA was engaged in the following tasks as part of this contract.

- Documentation of safety program plans of eight existing rapid rail transit authorities

- Participation in system reviews of six transit systems
- Identification of key safety problems in bus and rapid rail systems and selection of safety priorities
- Support to UMTA and the Transportation Systems Center in the establishment of a national Transit Reliability Information Program (TRIP)
- Development of a manual of transit system security guidelines
- Creation of a library of safety and system assurance documents.

A final report on contract activities, completed in November 1978, discusses the outcome of the tasks listed above.

Mass Transit System Safety and Product Qualification

Under a contract with the Office of Safety and Product Qualification (MA-06-0060), the Transportation Systems Center (TSC) supplies UMTA with in-house technical and management resources in the planning, conduct and evaluation of safety and product qualification activities.

During FY 78, TSC supplied support on the 16 (b) 2 Vehicle Quality and Safety Improvement Project, the initiation of the Transit Reliability Information Program (TRIP), and the technical assessment of the Washington Metropolitan Area Transit Authority (WMATA) rail system described in Chapter 3. In addition, TSC participated in six system reviews, assisted on a task force to frame a Rail Transit Safety Program Plan, and supported the



Use of fire-retardant materials prevented the spread of fire in this incident of attempted arson in a subway car.

Transportation Safety Institute by furnishing associate instructors in courses and seminars.

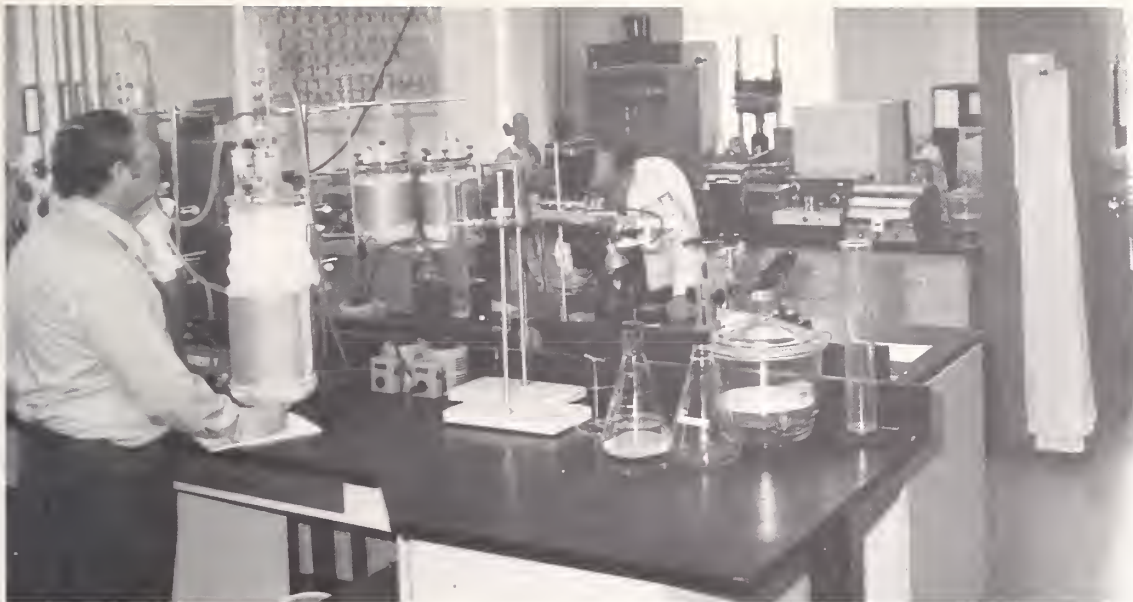
In the future, TSC will provide support for an accident/incident reporting system, system safety reviews, courses taught by TSI, crashworthiness standards, human factors research and general research.

16 (b) 2 Vehicle Problems and Qualifications

The Office of Safety and Product Qualification is concerned with the quality of vehicles which are procured for mass

transit purposes. Currently, a large number of vehicles are being purchased by state DOTs and their local representative under Section 16 (b) 2 of the Urban Mass Transportation Act, which allocates funds to each state to help private, non-profit organizations provide transportation for the elderly and handicapped.

A project (MA-06-0060) being carried out by TSC and the University of Michigan will establish standards of quality for these vehicles. Primary emphasis has been placed on ten-to 15-passenger vans, as well as on larger-sized vehicles. Ordering specifications, including specifications for heavy duty components where available, have been generated and distributed. A



Results from tests made at the Hazardous Materials Testing Laboratory at TSC are entered directly into a computer data bank from a terminal in the lab.

media presentation package is being prepared for state administrators of the 16(b)2 program and for local non-profit agency representatives. This package, being developed by the Michigan DOT in conjunction with the University of Michigan, is expected to be available in late FY 79.

Fire Safety in Transit Systems

The threat of fire is a significant safety issue in transit systems. A project (MA-06-0051) sponsored by the Office of Safety and Product Qualification attempts to deal with fire safety in a systematic way. Basic research, conducted at the Transportation Systems Center, will use

accident scenarios, available statistics and risk analysis to establish typical "chains" of fire propagation in different situations. An important resource in this effort is the data bank on various materials which is generated and continually updated at TSC. This data bank contains information on the flammability, smoke generation and toxic gas characteristics of materials used in transit systems. Once identification of fire sources is complete, remedial procedures will be developed, ranging from basic design and materials standards to changes in transit operating practices.

As part of this project, liaison will be maintained with other government agencies involved in similar projects, as well as with the American Public Transit Association (APTA) and the National Fire Protection Association (NFPA).

Safety and Product Qualification

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
Safety and Product Qualification Training Program	DC-06-0215	\$501,000	Sept. 1975-continuing	Transportation Safety Institute	Edward J. Boyle (202) 426-9545
System Safety and System Assurance Support	DC-06-0123	\$350,000	Dec. 1976-continuing	American Public Transit Association (APTA)	Edward J. Boyle (202) 426-9545
Development of a Safety Program Plan	CA-06-0105	\$96,000	July 1977-Jan. 1979	University of Southern California, Institute of Safety and Systems Management	William J. Rhine (202) 426-9545
Fire Safety in Transit Systems	MA-06-0051	\$1,270,000	June 1976-continuing	TSC	R. Haught (202) 426-9545
Mass Transit Safety and Product Qualification	MA-06-0060	\$1,874,000	June 1976-Oct. 1979	TSC	R. Haught (202) 426-9545
16 (b) 2 Vehicle Problems/Qualifications	MA-06-0060	\$404,000	Dec. 1978-Oct. 1979	TSC; University of Michigan	R. Haught (202) 426-9545

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

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Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

Safety in Urban Mass Transportation: Research Report

Proj. RI-06-0005
Battelle Columbus Laboratory
March 1976, PB 245-413/AS

Safety in Urban Mass Transportation: Guidelines Manual

Proj. RI-06-0005
Battelle Columbus Laboratory
May 1975, PB 245-413

Assessment of Current Fire Safety Efforts

Proj. MA-06-0051
W. Hathaway, Transportation Systems Center

A Final Report of the Safety and System Assurance Contract

Proj. DC-06-0123
American Public Transit Association
November 1978

Development of a Safety Program Plan for the Office of Safety and Product Qualification, Volume I

Proj. CA-06-0105
G.P. Jones, et al.
September 1977, PB 279-331

Development of a Safety Program Plan for the Office of Safety and Product Qualification, Volume II

Proj. CA-06-0105
G.P. Jones, et al.
September 1977, PB 279-332

Socio-Economic Research and Special Projects

Trends and Highlights



The Office of Socio-Economic and Special Projects encompasses a wide range of research, development and information dissemination programs. The office also has responsibility for carrying out projects that support UMTA's accessibility policies for the handicapped which have been developed in accordance with the Rehabilitation Act of 1973.

During FY 78, the major activity of the socio-economic research program was concerned with issues arising from the development of Automated Guideway Transit (AGT) systems. AGT-related studies covered a wide range of topics including assessments of existing systems, aesthetic evaluations and research information dissemination.

Another area of study was the Automated Transit Information System (ATIS). The ATIS is a computer-aided system that can automatically respond to consumer questions on bus and other transit services, including specific information on routes, schedules, fares, and related inquiries.

In FY 78, numerous projects were designed to help solve many of the problems transit operators face in attempting to make their vehicles and facilities accessible to the handicapped. Projects were developed to establish safety guidelines for lifting wheelchairs into or out of a transit vehicle, and for protecting wheelchair users during travel. Other projects studied ways in which transit stations could be made accessible to the handicapped.

The program has also been concerned with maintaining and improving UMTA's communications and technology sharing

efforts. This work involves a variety of techniques to encourage the exchange of information and to share UMTA's research and development projects with the entire transportation community and the general public.

Several other special projects were carried out by this office including work on the metric system, life-cycle-costing, and automated mixed-traffic vehicles (AMTV).

Socio-Economic Research

The Office of Socio-Economic and Special Projects has conducted many studies in recent years to evaluate the best ways and the optimum conditions in which to develop advanced AGT systems.

In one project, Assessment of Domestic AGT Systems (IT-06-0135), information was gathered on operational and performance statistics, operating history, and the designs, development and implementation of six AGT systems in the U.S. The six systems reviewed were the Sea-Tac system at the Seattle-Tacoma (Wash.) International Airport; the UMI Type II Tourister system near Richmond, Va.; the AGT System at Fairlane Town Center in Dearborn, Mich.; the WEDway system at Disney World in Lake Buena Vista, Fla.; the Passenger Shuttle System at the Tampa (Fla.) International Airport; and the Tunnel Train System at the Houston (Tex.) Intercontinental Airport.

Another project, Morgantown Independent Assessment (IT-06-0157), was developed to study Phase I (September 1975 to July 1978) of the automated people mover system at West



Costs and performance of innovative techniques, such as this tramway from Roosevelt Island to Manhattan, are being assessed for future applications.

Virginia University in Morgantown. Additional AGT work was undertaken in the project, Further Domestic Assessments (IT-06-0188), which assessed AGT systems in Busch Gardens, Va.; at Duke University Hospital, N.C.; and at the Miami, Fla. International Airport. All of these assessments included extensive coordination with the manufacturers.

The Aerobus Assessment (IT-06-0189) was carried out to investigate a range of quantitative standards which might be used to evaluate the potential of using suspended cable systems in urban areas. Two cable systems were assessed. One system, the Aerobus, developed and

manufactured in Zurich, Switzerland, was operated for six months in Mannheim, West Germany. The other system is the Roosevelt Island Tramway in New York City.

Four AGT systems were studied in project MA-06-0069. These were AIRTRANS at the Dallas-Fort Worth airport; Val, a French system; Minitram, a British concept; and Cabinlift/Cabintaxi, a German System. This information-gathering project was designed to expand the inventory of AGT information already available, in order to assist in future studies, including alternatives analyses.

The technical support program conducted by the Office of Socio-Economic and Special Projects (IT-06-0176) includes technical coordination and analytical assistance in preliminary studies of land use and other urban impacts of AGT systems.

Some ten U.S. cities are involved in the decision-making process about the design and possible implementation of downtown people mover (DPM) systems. One of their major concerns is the impact that the DPM might have on the aesthetic quality of the urban space it will occupy. In a project entitled DPM Aesthetic Evaluation (TX-06-0026) Rice University's VISIT (Visual Simulation In Time) computer model is being used to investigate the urban design and aesthetic issues associated with the establishment of DPM systems.

As proven in Frankfurt, West Germany, the involvement of community residents in AGT planning is of critical importance. To take advantage of the Frankfurt experience, a study, Evaluation of U.S. Applicability of Battelle-Frankfurt Citizen Participation Techniques for AGT Planning (OH-06-0025) is being carried out.

Another element critical in policy decisions is the determination of the size of the potential market for AGT systems. One such study, AGT Socio-Economic Research Program: Markets (IT-06-0165), conducted both generic and site-specific research, including interviews and simulated alternatives analyses in Chicago, Ill., Atlanta, Ga., and Dallas, Tex.

A review of the decision-making process followed in local urban areas was made in the study, Review of Local Alternatives Analyses of AGT Case Studies

(NY-06-0057). This project was developed in an effort to determine why AGT systems were not chosen as a preferred alternative. The study also explored the issues which were perceived as most significant in reaching decisions about the merits and liabilities of AGT systems.

In the Generic Alternatives Analyses Project (IT-06-0168) AGT systems were compared to conventional bus, rail, and paratransit modes. The results will be used to help identify the types of urban applications in which AGT systems are most promising, as well as to analyze the trade-offs in terms of demand, cost, and economic, social, environmental and institutional impacts of each mode.

The AGT Research Dissemination project (IT-06-0167) was designed to disseminate the results of research sponsored by the Office of Socio-Economic and Special Projects to planners, transit operators, representatives of government agencies, and transportation consultants. Information will be disseminated through conferences, workshops, seminars, and a variety of reports and graphic presentations.

System Studies, Support and Development

Automated Transit Information System (ATIS)

In FY 78, the Office of Socio-Economic and Special Projects conducted several projects which supported the development and demonstration of an Automated Transit Information System (ATIS). The system, in

test operation in Washington, D.C., is a computer-aided program that will locate and supply information in response to consumer questions about bus and rail transit service. The ATIS is expected to increase accuracy and reduce response time to questions about schedules, routes and fares while cutting the time and cost needed to train information operators.

An ATIS Prototype Demonstration Project (DC-06-0154) was developed for trial operation in the Washington Metropolitan Area Transit Authority (WMATA). As a demonstration, the project was designed to determine the technical, operational, and economic feasibility of the ATIS. To insure that WMATA will meet with operational and technical success, the project, ATIS Technical Support (MD-06-0037), was developed. The support project reviews proposed work plans, evaluates progress, and conducts independent studies to aid in the ATIS demonstration.

A project entitled ATIS Data Base Integration (VA-06-0052) is developing a report on recent innovations in information systems for scheduling, routing and monitoring vehicle movement, and providing customer information. The project will conduct workshops on the analysis of system design and evaluation. The project will also identify ways in which ATIS algorithms and data base can be used in other transit operations to help spread the costs and benefits of ATIS among several functional areas.

Another project, ATIS Voice Response (VA-06-0054), was undertaken to determine if computerized voice response could be used to improve the operational performance of ATIS. Included



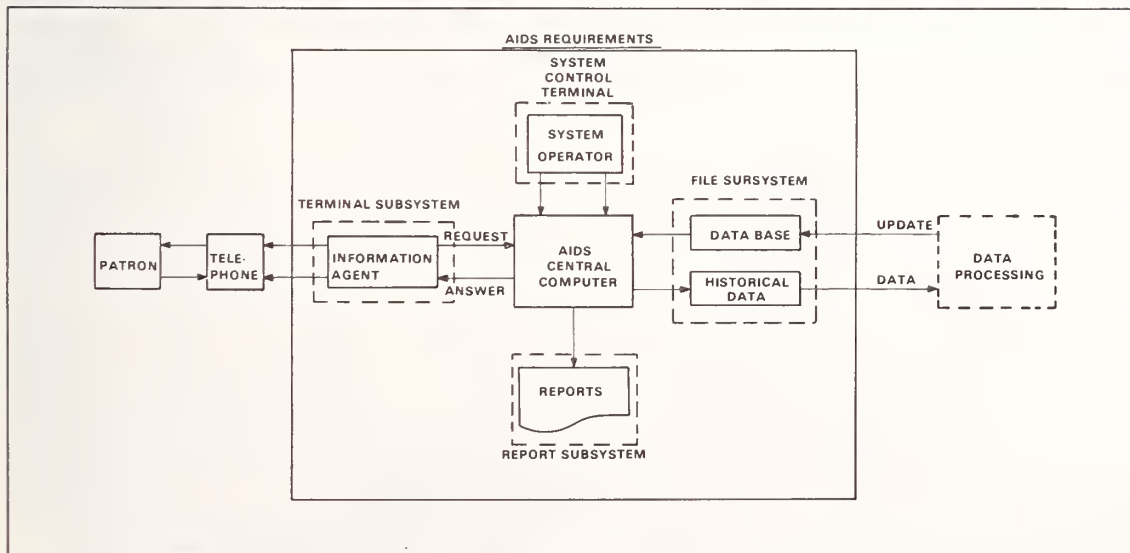
in this study will be a systems requirement analysis and a feasibility study of using computerized voice response (VRS) as part of an ATIS. A brief overview of computer technology will be made to determine if VRS might be used either now or in the near future.

Accommodation of Elderly and Handicapped Travellers

Section 504 of the Rehabilitation Act of 1973 requires that "...no otherwise qualified handicapped individual in the United States...shall solely by reason of his handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance."

UMTA issued proposed regulations describing minimum accessibility requirements which must be met in all transit facilities and vehicles in order to qualify for the use of federal funds. Additional and continued planning and coordination of the design aspects of elderly and handicapped programs is well under way and is the responsibility of the Office of Socio-Economic and Special Projects.

The office is developing an Elderly and Handicapped Program Plan (VA-06-0051) to improve transit accessibility for elderly and handicapped travellers. The project is designed to aid in selecting future projects and in ordering priorities to insure the best allocation of available funds. The program will identify barriers to the transportation handicapped. It will identify the number of handicapped who feel inhibited from using transit. It will also identify the degree of importance of the individual barriers to the handicapped.



Information operators at WMATA must consult many different sources — maps, directories, schedules — to answer patrons' questions. With the Automatic Information Directory System sketched below, transit patrons will be able to get exact information quickly by telephone.

Several projects were developed to examine existing transportation facilities to determine the extent to which they provide for the safety of the elderly and handicapped. One project, Crash Protection Systems for Handicapped Transit and School Bus Occupants (DC-06-0200), was jointly sponsored by UMTA and the National Highway Traffic Safety Administration (NHTSA). This project is developing a seating system that protects handicapped passengers with or without wheelchairs. An entry system to transit vehicles that is not hazardous in its storage position during an emergency stop or crash is also being developed. The project included crash experiments using two types of buses and lifesize dummies, which were instrumented to measure the force experienced at different points of their "bodies."

Studies of the effects of the crashes on the buses and dummies will help in designing safer buses and seating systems. Studies planned for FY 79 include both front and rear test crashes of medium and large sized buses at speeds of up to 30 mph. It is hoped that a full-scale model of a passenger protection system will be developed from this research by FY 80.

Another safety project, Safety of Wheelchair Loading and Securement Systems (CA-06-0098), investigated wheelchairs in vehicle fastening systems and wheelchair/transit vehicle loading systems. The project developed safety guidelines for wheelchair loading equipment and investigated wheelchair fastening systems including their cost, crashworthiness, ease of use, and acceptability to the user. The study also found that a fastening system is necessary



Crash protection systems for wheelchair occupants are being tested jointly with the National Highway Safety Administration's schoolbus test program.





Elevators which parallel the incline of neighboring escalators accommodate wheelchair users in the Stockholm subway. The elevator has direct access to the sidewalk with no intervening architectural barriers.



because standard wheelchair brakes do not offer sufficient protection to the user when the wheelchair is in a transit vehicle.

The problem of handicapped accessibility to transit stations was addressed in the project, Escalator Modification Kit (IT-06-0164). This project will design, build, and test a prototype "modification kit" to make the escalator more accommodating to the elderly, semi-ambulatory and wheelchair users.

The transit system in Stockholm, Sweden, has had very successful experience with 36 inclined elevators

installed in 20 transit stations, making the stations accessible to all citizens. A project, Stockholm Inclined Elevator Assessment (IT-06-0172), was undertaken to study Stockholm's experience to see if the system could be applicable to transit stations in the U.S. The study found that not only do the handicapped and elderly use the inclined elevator, but it is used by parents with baby carriages, people with packages, and travellers with dogs. The study concluded that with some minor changes, the inclined elevator could be used in the U.S., and it recommended that

an inclined elevator demonstration project be undertaken.

Project Evaluation

The Office of Socio-Economic and Special Projects also serves as a focal point for independent evaluation activity within the Office of Technology Development and Deployment (UTD). Prior work has concentrated on developing experimental design plans to guide in the conducting of evaluations. Recently, this work has been broadened to include responsibility for conducting the evaluations as well.

Work in progress during FY 78 concerned the development of an analysis of the requirements for wheelchair lift devices, development of socio-economic impact analysis plans for the Morgantown People Mover and Downtown People Mover projects, and development of evaluation plans for the demonstration of advanced automatic vehicle monitoring at the Southern California Rapid Transit District. Also being developed is an evaluation of an Automated Transit Information System at the Washington Metropolitan Area Transportation Authority in Washington, D.C.

Special Projects

Several projects conducted by the office do not readily fit into any distinct project grouping, but fall under the heading of Special Projects.

A project entitled UTD Special Reports and Discussion Papers (MD-06-0032) studied possible federal incentives to stimulate greater innovations in mass transit technology and options for overcoming barriers to the introduction of new transit products into commercial service. Preliminary efforts of this project included consultation with selected transit industry officials representing the points of view of both operating properties and equipment suppliers.

A study entitled AMTV Market Estimates (DC-06-0196) was developed to determine the potential national market for Automated Mixed Traffic Vehicles (AMTV). AMTV is an automated vehicle capable of moving in a mixed traffic environment without a driver aboard, while automatically avoiding obstacles and pedestrians. The study, undertaken jointly



Officials of U.S. DOT and the Federal Republic of Germany Ministries of Transportation and Research and Technology met at a workshop to review policy and technological developments useful to both countries.

by UMTA and NASA, includes a review of potential sites for the AMTV, such as pedestrian malls, airports, and college campuses. Sites will also include special applications for the elderly and handicapped and possibilities for demonstration projects.

The Life Cycle Costing General Feasibility Study (RI-06-0007) was developed to survey current life-cycle-costing procedures and to determine how these procedures might be applied by UMTA and transit operators in the procurement of transit equipment. The project developed the necessary methodology to allow a transit operator to

selectively purchase small buses on the basis of life-cycle-costing. Workshops explaining the method were conducted with representatives of six transit properties, UMTA staff members, and manufacturers of small buses.

A Self-Cancelling Ticket Project (IT-06-0125) was undertaken to determine the technical, operational, and economic feasibility of developing a self-cancelling parking permit. The permit, for use in congested urban areas, relies on a chemical reaction to trigger a perceptible color change on the face of the permit after a predetermined length of time. Such a ticket will provide new options for

enforcing parking controls and thereby lead the way to better traffic management.

The Office of Socio-Economic and Special Projects also developed the project Metric Conversion Planning (IT-06-0209) to prepare for UMTA's orderly transition to the metric system (in accordance with U.S. Metric Act of 1975 and DOT Order 1020.1). Research was conducted to review the transit industry's plans for conversion and to recommend an UMTA policy and plan of action corresponding to that of industry.

Communications and Technology Sharing

A major effort of the Office of Technology Development and Deployment is to share the results of UMTA's research and development activities with planners, transit officials, elected officials, the public, and other interested groups. Three communications and technology sharing projects were developed for this program.

The largest project, Technology Sharing and Support (MA-06-0086), is funded through the Transportation Systems Center in Cambridge, Mass., and provides technical and analytical support to the Office of Technology Development and Deployment in an effort to share information with UMTA's client groups. In its information sharing effort, the Technology Sharing Office organizes and conducts conferences (e.g. UMTA's annual R&D Conference) and workshops. In addition, it writes and disseminates a variety of documents both on UMTA's technology development and deployment activities and on specific interest areas.

The office also works on improving the effectiveness of the Technology Sharing Program. The project is on-going,

and by the end of FY 78, had produced two major conferences, several major publications, and two highly useful pocket-size reference pamphlets. The Technology Sharing Office has also produced the 1977 and 1978 editions of *Innovation in Public Transportation*.

Another communications project, an educational exhibit entitled Subway Exhibit and Catalogue (DC-06-0179), was designed to show that subways can contribute to the community, that they can be aesthetically pleasing, and that they can be an inducement to economic growth. The exhibit, consisting of photographs and descriptions from subway systems around the world, is on tour. When completed, the exhibit will have been displayed in seven major American cities.

Under a third communications project (AL-06-0006), resource materials on international transit developments are being prepared by the N.D. Lea Research Corporation with support from UMTA and with cooperation from Canada and West Germany. The *International Transit Compendium* will consist of five separate issues, published within four years, on automated guideway transit, rail transit, roadway transit (including improved bus transit and paratransit), roadway transit vehicles, and moving way transit. This compendium will be supplemented by the *International Transit Handbook*, which will include transit classification, terminology, methods and techniques. An important feature of these two publications will be their trilingual format, with all information appearing in English, German and French. The handbook will also contain a trilingual glossary of transit terms.

Socio-Economic Research and Special Projects

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
SOCIO-ECONOMIC RESEARCH					
Assessment of Domestic AGT Systems	IT-06-0135 MA-06-0067	\$450,00	June 1975- Nov. 1978	TSC; SRI International	Howard Evoy (202) 426-4022
Morgantown Independent Assessment	IT-06-0157	\$195,353	Jan. 1977- July 1979	N.D. Lea and Associates	Howard Evoy (202) 426-4022
Further Domestic Assessments	IT-06-0188	\$99,501	April 1978- Jan. 1979	N.D. Lea and Associates	Howard Evoy (202) 426-4022
Aerobus Assessment	IT-06-0189	\$99,856	Oct. 1978- July 1979	N.D. Lea and Associates	Howard Evoy (202) 426-4022
Assessment of Cabinlift/Cabintaxi AIRTRANS, VAL, and Minitram	MA-06-0069	\$122,000	June 1974- Sept. 1979	TSC	Howard Evoy (202) 426-4022
AGT Socio-Economic Research, Technical Support	IT-06-0176	\$180,000	July 1977- June 1979	MITRE Corp.	Howard Evoy (202) 426-4022
DPM Aesthetic Evaluation	TX-06-0026	\$39,900	Aug. 1978- Jan. 1979	Rice Center	Howard Evoy (202) 426-4022
Evaluation of U.S. Applicability of Battelle-Frankfurt Citizen Participation Technique for AGT Planning	OH-06-0025	\$65,000	Sept. 1978- May 1979	Battelle Columbus Laboratory	Howard Evoy (202) 426-4022
AGT Socio-Economic Research Program: Markets	IT-06-0165	\$335,000	Oct. 1977- May 1978	Cambridge System- atics, Inc.	Howard Evoy (202) 426-4022

Socio-Economic Research and Special Projects

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
SOCIO-ECONOMIC RESEARCH					
Review of Local Alternatives Analyses of AGT Case Studies	NY-06-0057	\$109,000	Feb. 1977- Feb. 1979	Urbitran Associates	Howard Evoy (202) 426-4022
Generic Alternatives Analyses	IT-06-0168	\$372,971	Aug. 1977- May 1979	W.V. Rouse and Co.	Howard Evoy (202) 426-4022
AGT Research Dissemination	IT-06-0167	\$223,000	Sept. 1977- March 1979	Transportation Assistance, Inc.	Howard Evoy (202) 426-4022
SYSTEMS STUDIES, SUPPORT, AND DEVELOPMENT					
Automated Transit Information System [ATIS]					
ATIS Prototype Demonstration	DC-06-0154	\$435,000	Sept. 1976- July 1980	WMATA, Washington, D.C.	John Durham (202) 426-4022
ATIS Technical Support	MD-06-0037	\$100,000	Nov. 1977- Nov. 1979	National Bureau of Standards	John Durham (202) 426-4022
ATIS Data Base Integration	VA-06-0052	\$100,000	Nov. 1978- Dec. 1980	MITRE Corp.	John Durham (202) 426-4022
ATIS Voice Response	VA-06-0054	\$50,000	Nov. 1978- Sept. 1979	Input/Output Computer Services	John Durham (202) 426-4022
Accommodation of Elderly and Handicapped Travellers					
Elderly and Handi- capped Program Plan	VA-06-0051	\$20,000	April 1978- March 1979	Alan A. Warshawer and Associates	P. Simpich (202) 426-4023
Crash Protection System for Handi- capped Passengers in School and Transit Buses	DC-06-0200	\$150,000	Nov. 1977- Oct. 1979	NHTSA; Minicars, Inc.	P. Simpich (202) 426-4023
Safety of Wheel- chair Loading and Securement Systems	CA-06-0098	\$160,000	Oct. 1976- Oct. 1979	Caltrans; Minicars, Inc.	P. Simpich (202) 426-4023

Socio-Economic Research and Special Projects

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
SYSTEMS STUDIES, SUPPORT, AND DEVELOPMENT					
Accommodation of Elderly and Handicapped Travellers					
Escalator Modification Kit	IT-06-0164	\$325,000	Aug. 1978- April 1980	Foster Miller Associates, Inc.	P. Simpich (202) 426-4023
Stockholm Inclined Elevator Assessment	IT-06-0172 DC-06-0167	\$29,000	Sept. 1977- Feb. 1979	General Services Administration; DeLeuw Cather and Co.	P. Simpich (202) 426-4023
Other Projects					
UTD Special Reports and Discussion Papers	MD-06-0032	\$97,000	March 1978- March 1980	Onyx Corporation	Henry Nejako (202) 426-9261
AMTV Market Estimates	DC-06-0196	\$50,000	Oct. 1977- Jan. 1979	SRI International	Howard Evoy (202) 426-4022
Life-Cycle-Costing: General Feasibility Study	RI-06-0007	\$139,000	March 1975- March 1979	Naval Underwater Systems Center; Dudley W. Gill and Associates	P. Simpich (202) 426-4023
Self-Cancelling Ticket	IT-06-0125	\$137,000	Feb. 1976- Feb. 1978	Arthur D. Little, Inc.	John Durham (202) 426-4022
Metric Conversion Planning	IT-06-0209	\$55,000	Feb. 1978- Dec. 1979	Automated Management Systems	John Durham (202) 426-4022
Communications and Technology Sharing					
Technology Sharing Support	MA-06-0086	\$180,000	Oct. 1977- continuing	TSC	Henry Nejako (202) 426-9261
Subway Exhibit and Catalogue	DC-06-0179	\$75,000	Oct. 1978- Oct. 1979	The Smithsonian Institution	Diane Enos (202) 426-4043
International Transit Compendium	AL-06-0006	\$50,000	April 1978- Dec. 1980	N.D. Lea Transportation Research Corp.	M.J. Ruggles (202) 426-9261

Bibliography

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An Automated Information Directory System [AIDS]: Review and Specifications

Proj. VA-06-0038
MITRE Corporation
July 1977, PB 272-253/AS

Comparison of the Performance of Three Algorithms for Use in an Automated Transit Information System

Proj. MD-06-0013, MD-06-0037
National Bureau of Standards
August 1977

Cost/Benefit Analysis of Automated Transit Information Systems

Proj. MD-06-0013, MD-06-0037
National Bureau of Standards
February 1977, NBSIR 77-1235

Experimental Design Plan for the Downtown People Mover Demonstration Projects:

Final Report

Proj. DC-06-0162
Peat, Marwick, Mitchell and Co.
April 1977, PB 270-614

Life-Cycle Cost Model for Comparing AGT and Conventional Transit Alternatives

Proj. CA-06-0090
General Research Corporation
February 1976, PB 259-529

Assessment of Operational Automated Guideway Systems: Airtrans (Phase I)

Proj. MA-06-0067
Transportation Systems Center
September 1976, PB 261-339/AS

Assessment of Operational Automated Guideway Systems—Jetrail: Final Report

Proj. MA-06-0067
Transportation Systems Center
December 1977, PB 278-521/AS

Development/Deployment Investigation of Cabintaxi/Cabinlift Systems: Final Report

Proj. MA-06-0067
Transportation Systems Center and
SNV Studiengesellschaft Nahverkehr mbH
December 1977, PB 277-184/AS

Technological Qualification Guidelines for AGT Systems, 1976

Proj. MA-06-0064

Technological Qualification Guidelines for Shuttle Loop Transit Systems

Proj. MA-06-0064
1976

Technological Qualification Guidelines for Bus Vehicles

Proj. MA-06-0064
1976

Proceedings of the Second Urban Mass Transportation Administration/American Public Transit Association Research and Development Priorities Conference, Arlington, Virginia, Nov. 30 - Dec. 1, 1976

Proj. DC-06-0157
American Public Transit Association
March 1977, PB 266-158/AS

Proceedings of the Urban Mass Transportation Administration/American Public Transit Association Research and Development Priorities Conference

Proj. DC-06-0136
American Public Transit Association
May 1976, PB 255-898/AS

Life-Cycle Costing for Current Rohr and AM General Buses and General Motors RTS-II Bus

Proj. VA-06-0039
Advanced Management Systems, Inc.
July 1976, PB 255-091/AS

Assessment of the Satellite Transit System (STS) at the Seattle-Tacoma International Airport

Proj. IT-06-0135
SRI International
December 1977, PB 281-820

Assessment of the UMI Type II Tourister AGT Systems at King's Dominion

Proj. IT-06-0135
SRI International
December 1977, PB 286-513

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SECTION TWO
Service and Methods
Demonstrations



Service and Methods Demonstrations

The purpose of the Service and Methods Demonstrations (SMD) Program is to improve the quality and efficiency of urban transportation by sponsoring the implementation of new transportation management techniques and innovative transit services throughout the United States. The program focuses on strategies that utilize existing transportation technology to provide improvements which require relatively low levels of capital investment and can be implemented in a short time frame. Some of these strategies have already been successfully employed in other parts of the world. Others are based on recent conceptual or technological developments by UMTA or by local transit properties in the United States. The program is designed to perform the final critical experimental tests and development steps, where required, and to bring these innovative strategies into full operational application.

Service and methods demonstrations reflect the philosophy that the travel needs of urban areas are best served by a balanced transportation system. In most cases, this requires a combination of travel

modes (automobile, paratransit, bus, etc.) to provide a variety of services for various users, trip purposes, and travel patterns. Many demonstrations specifically address the technical and institutional issues of integrating a mix of transportation services provided by both public and private operators to serve a community's travel needs.

The SMD program places emphasis on the use of minor physical changes and operational policies to expand the capacity and increase the productivity of existing systems. This emphasis is consistent with, and provides technical support for, the Transportation Systems Management element (TSM) of the joint planning and programming regulations issued by UMTA and the Federal Highway Administration (FHWA). Many of the techniques which have been proven feasible through SMD demonstrations have subsequently been incorporated in Transportation Improvement Plans (TIP) of urban areas.

Innovative services and methods which have been demonstrated in the SMD program also support such important national goals as improved environmental quality and energy conservation.

Moreover, these improvements will have more immediate impacts than activities with long lead times, such as the development of a new technology or the implementation of major new facilities.

Demonstration activities have been divided into four major program areas. These areas are described briefly below.

Transportation Service for Special User Groups

This area seeks to develop and test specialized services that will provide for the travel needs of transit dependent people, particularly the elderly, the handicapped, and the poor. Projects in this area have included testing of specialized equipment to make public transportation more accessible to handicapped travelers, specialized demand responsive door-to-door services, user-side subsidies, and coordination of social service agency transportation programs.

Fare and Pricing Policies

This area focuses on the application of innovative pricing policies and transit service improvements to provide incentives for the use of public transportation and

more efficient utilization of existing highway and parking facilities. The emphasis in this area is evolving from systemwide fare policies to pricing specific travel markets in order to distribute benefits more equitably, attract new riders, and improve the productivity of underutilized vehicles. Projects in this area include alternative methods of fare payment, fare free transit, fare incentive promotions, transit service improvements, and congestion pricing for automobiles.

Conventional Transit Service Innovations

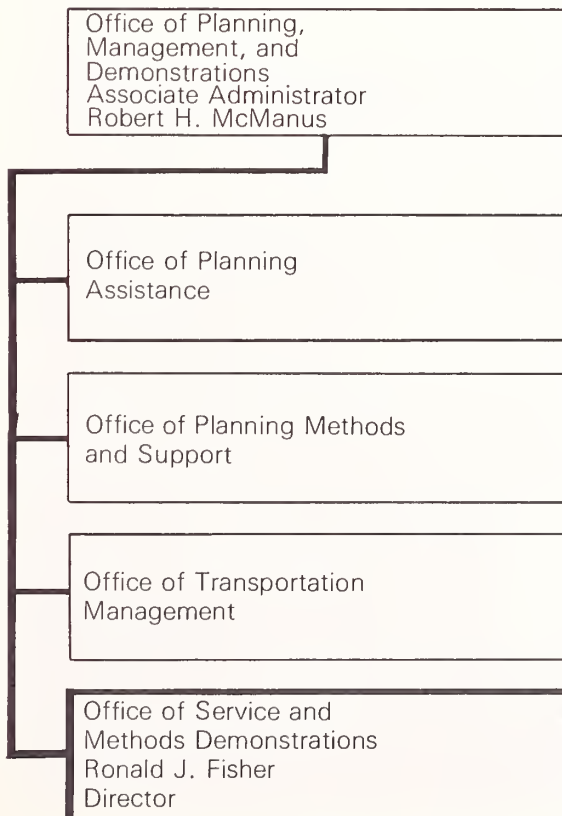
Demonstrations in this area include the innovative use of traffic engineering techniques and transit service policies aimed at improving conventional fixed route transit systems and more effective utilization of existing transportation and urban resources. Emphasis has been placed on expediting peak period movements of passengers on surface transit vehicles (bus, light rail, and trolley bus). However, many of the strategies can and have encouraged greater use of other multiple occupant vehicles such as carpools and vanpools. Projects in this area have included exclusive busways, reserved lanes on freeways, arterials, and local streets, signal preemption, transit malls, auto restricted zones, and vehicle innovations.

Paratransit

This area includes a broad range of services that lies between conventional fixed route transit and the private automobile (e.g., demand responsive transit, jitneys, taxis, vanpools and carpools). The primary focus is on the use

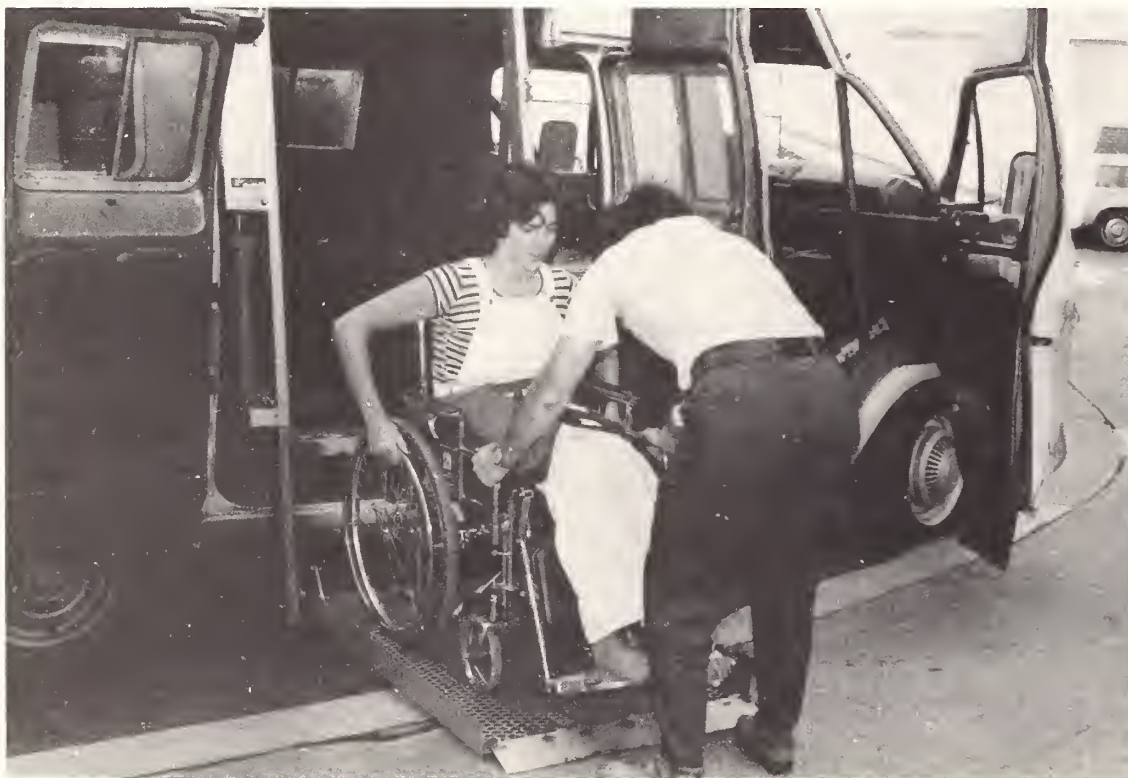
of these alternative travel modes to provide more efficient use of transportation facilities in those situations where conventional transit service is uneconomical to operate or simply ineffective.

The organization of the Office of Planning, Management and Demonstrations is shown below. The projects described in this section are funded and administered through the Office of Service and Methods Demonstrations which is indicated in bold outline on the chart.



Transportation Services for Special User Groups

Trends and Highlights



The term "special users" refers to those members of the population who, because of age, income or disability, are dependent upon public transportation or other special arrangements to meet their transportation needs.

One of the objectives of the UMTA Service and Methods Demonstrations Program is to improve the mobility of an estimated 7.5 million urban Americans who are transportation handicapped. The principle of total accessibility is being tested in a number of cities. Special equipment for handicapped people has been designed and is in use in fixed-route service in selected areas. In addition, a variety of special transportation services are being tested throughout the country, ranging from user subsidy programs to new transportation brokerage systems.

Successful testing of the user subsidy concept has been demonstrated in projects in Montgomery, Ala., Lawrence, Mass., Kinston, N.C., as well as in Danville, Ill., where an additional grant will allow the expansion of an experimental subsidy program to include the entire city.

One of the major problems in providing transportation to special groups has been the duplication of services among the human service agencies. Programs to promote the coordination of these services are being funded by UMTA, and the programs are demonstrating a variety of arrangements ranging from promoting cooperation among agencies to consolidation of all their equipment and transportation services. In other projects, the local transit authority acts as a broker, matching the demand for special services with available supply from both public

vehicles and private companies.

A number of problems have been encountered. Mechanical difficulties, particularly with wheelchair lifts, have caused delays in the extension of fixed-route service to all. However, these setbacks are counteracted by the variety of successful paratransit programs being conducted.

Identifying and Reaching the Transportation Handicapped

Through a \$1.9 million research contract, the Service and Methods Demonstrations Office has undertaken a project (NY-06-0054) in an attempt to define effective transportation for those handicapped persons who encounter difficulty in using conventional transit. The main objective of the research is to determine whether it would be more cost-effective and beneficial to modify existing and new transportation systems to accommodate handicapped persons, or to design specialized transportation.

The first phase of the project, completed during FY 78, consisted of a comprehensive national survey to determine the number of transportation handicapped people in the country, their characteristics, their current transportation behavior and the perceived barriers preventing their use of public transportation. This information, as well as an assessment of alternative solutions, was published in June 1978, in *Summary Report of Data from a National Survey of Transportation Handicapped People*.

According to the survey, some 7,440,000 handicapped people over five years of age reside in the nation's urban areas. Demonstration projects are being designed under this research contract to test proposed solutions, and a document is being produced that contains guidelines for urban transportation planning for special users.

Also planned is a report addressing major issues and alternative solutions to improve transportation for special user groups. Several transit systems will be investigated to determine the impact of transportation programs for the handicapped, and attitude surveys will be taken of both handicapped and non-handicapped people in cities which have transportation programs.

Accessibility Programs

Accessible Full-Size Bus Services

The Transbus decision requiring all buses purchased with federal funds after September 30, 1979, to be accessible to the handicapped, will have major ramifications within the transit industry this year.

In essence, the UMTA mandate requires that all buses bid after September 30, 1979 be specially equipped, and that 50 percent of existing bus fleets be retrofitted with lifts or ramps within six years. In six years.

Accessibility demonstrations begun in FY 78, however, have revealed a number of practical problems which must be overcome in deploying standard buses which accommodate wheelchairs.

In an attempt to collect data on the use of standard-size, accessible buses, research is being conducted in two categories. The first experiments involve

demonstration projects conducted in Palm Beach County, Fla., and in Champaign-Urbana, Ill. In these demonstrations, all existing buses are being retrofitted with lifts to accommodate wheelchair users, making the entire bus fleets accessible to semi- and non-ambulatory passengers. These two projects will be detailed later.

The second set of projects (MA-06-0049) used to obtain data on accessible bus service involved locally sponsored efforts in major urban areas to introduce a number of accessible buses into their standard bus fleets. In these demonstrations, federal capital grants were used to retrofit a portion of the existing full-size bus fleets to be accessible to the handicapped. In some cases, new buses were purchased with lifts. From five to 200 accessible buses are being used in projects in St. Louis, Mo., Atlanta, Ga., Washington, D.C., and Los Angeles, San Diego and Santa Clara County, Calif.

In St. Louis, accessible service was initiated in FY 78, but had to be severely reduced due to continuing lift equipment malfunctions. It was expected to take between nine months and a year before the problems could be corrected and the full component of accessible buses placed into operation again.

Two reports on St. Louis' experience were prepared in draft form in 1978 and are expected to be published this year.

Washington, D.C., expects to introduce accessible buses into its regular fleet in July 1979, along with driver and user training programs.

These projects entail the first large-scale use of wheelchair-accessible, full-size buses and, as such, the experience gained is expected to be of interest to many other



This passenger has immediate ground level access to a kneeling bus in St. Louis, Mo.

transit systems planning similar programs.

The use of fully accessible buses will improve the mobility of handicapped persons but, due to the limitations of transit area coverage, it is obvious that a fully accessible, fixed-route system will not meet all of the travel needs of handicapped people. The evaluations of these projects will identify which travel needs are not being met and determine appropriate services to supplement fixed-route service

in order to meet these needs.

Initial ridership on the accessible bus services to date has been low. However, the level of service has also been low. A major issue is whether wheelchair-handicapped ridership will increase as more accessible service is provided and as time passes to allow for adjustments in travel patterns and travel modes. The accessible bus evaluations will help supply answers to this question.

Total Accessibility Demonstrations: Champaign-Urbana, Ill., and Palm Beach County, Fla.

These two demonstrations (IL-06-0039 and FL-06-0015) were designed to evaluate the effectiveness of a fully accessible fleet of buses, rather than a partially accessible fleet, as an alternative for meeting the transportation needs of the elderly and handicapped. Fifteen buses in Illinois and 30 buses in Florida will be retrofitted with wheelchair lifts. In addition, each bus system will receive a number of new, specially equipped buses. In Florida, bids were received for the project at the end of FY 78, and accessible service was to be phased in by routes beginning in May 1979.

A number of factors will be evaluated in both demonstrations, such as the cost of retrofitting, the utility and durability of the technology, the level of accessibility provided, the effect on maintenance costs, driver responsibility, the travel characteristics of the transportation handicapped and, in the case of Champaign-Urbana, the effect of severe weather conditions.

Special Elderly and Handicapped Services for a Medium-Size City

In Portland, Ore., a special needs transportation demonstration (OR-06-0004) provides demand-responsive bus service to mobility-limited people who cannot use regular transit service and who do not have alternate means of private transportation. The demonstration, known as the LIFT, provides service on an advanced reservation basis from 7:00 a.m. to 7:00 p.m. daily, using a fleet of 15 Mercedes Benz diesel buses which are specially

equipped with wheelchair lifts, tie-downs and a retractable lower step. The public transit agency, Tri-Metropolitan Transportation District of Oregon (TRIMET), is operating the service. Some trips are contracted out to two local taxi operators.

The central feature of the LIFT program is the coordination of special transportation services with public service agencies and organizations which serve the handicapped. Under the current arrangement in Portland, LIFT serves as a central source of rides. Agencies contract with LIFT for their clients' trips, and other eligible but non-agency affiliated riders pay 50 cents per trip. Three out of four of the 4,200 registered riders are clients of various social service agencies.

Management and operational changes were instituted in the program during the summer of FY 78 to improve the system. In June, an interim report was published on the demonstration project. In addition to testing coordinated services, the project tested credit card fare collection and computerized billing for their cost-effectiveness and general feasibility. This unsuccessful element of the project was discontinued in November 1978.

Coordinated Services for the Elderly and Handicapped

In many cities and regions, special transportation services for the elderly and handicapped are either funded or provided by a variety of social service agencies and organizations. However, because their transportation resources are usually not

coordinated, the transportation services provided by human service agencies are often inefficient, overlapping and costly. Meanwhile, many handicapped and elderly people remain unserved by the uncoordinated systems.

A coordinated transportation program, encompassing public and private transportation services firms in conjunction with the social service agencies, could provide at least a partial solution to the problem of immobility which is still experienced by millions of elderly and handicapped Americans living in cities.

UMTA has been experimenting with systems to bring about coordinated transportation services in a number of

localities of various sizes, including New York City and Mercer County, New Jersey. Planning studies were conducted in Brockton, Mass. and Dallas, Texas.

In Mercer County, N.J., a pilot program called TRADE (NJ-06-0008) was begun in November 1977, to coordinate the transportation services of a number of social service agencies. In addition to the agencies, the project was eventually to include public and private transportation providers in the coordinated services as well. The objective of the project was to provide a foundation for supplying transportation services to all elderly and handicapped people in the region by establishing an effective, multi-modal network of vehicles.

During its first year of operation, however, progress was slow, and TRADE encountered many institutional and operational obstacles. While the original plan was to coordinate and eventually consolidate seven designated county agencies, the first year's experience caused a shift in the project's direction. TRADE was unable to coordinate all of the agencies during FY 78, and it now appears that several of the agencies may not be appropriate candidates for coordination. Two agencies with a total of 11 vehicles were included in a central dispatch system. Other agencies participated in central purchasing and vehicle maintenance. TRADE has recently contracted to provide services to agency clients using funds available under Title XX of the Social Security Act.

In addition to coordinating vehicles for various agencies, TRADE is expected to acquire vehicles of its own in 1979. Among those vehicles will be two vans which were



The jolts of normal traffic can be dangerous as well as uncomfortable for wheelchair users. Shown here is one method for securing wheelchairs. A curved spring snaps over the rear left wheel and a padded bar protects the passenger.

included in a grant awarded to TRADE in early FY 79 by the New Jersey Department of Labor, which has designated the TRADE program as the official transportation provider in the region under the department's Jobs Transportation Program. The demonstration is expected to run through October 1979.

In the East Flatbush area of New York City, a project entitled Coordinated Service for the Handicapped (IT-06-0154) is being conducted to study and complete a design

for providing barrier-free transportation to the elderly and handicapped in a large metropolitan area.

New York City was selected for this project because of the size and population density of the city and the resulting problems in a large, metropolitan area, such as the complexity of the existing transportation network, the funding mechanisms available in the city, and the diversity of institutional considerations.

During FY 78, East Flatbush in the

Borough of Brooklyn was selected as the target site for the potential demonstration project on the basis of three factors: its population density and the number of elderly and handicapped residents in the area; the diversity of governing bodies, citizens advisory groups, neighborhood councils, mental and general health boards, and social service agencies in the area; and the large number of places that would be accessible to the handicapped in East Flatbush if barrier-free transportation were available.

In Dallas County, Tex., a study (TX-06-0025) similar to the one in New York City is also being conducted to design a method for coordinating social service agency transportation, eliminating overlapping services, improving vehicle productivity and reducing costs through centralized dispatching.

The county has contracted with the Community Council of Greater Dallas to conduct the planning study. The main objective of the project is to coordinate social service agencies throughout the county and to develop groups of agencies willing to work together and share their transportation resources on a contract basis.

During FY 78, the most innovative feature of the project was the development of a standardized cost-accounting system which agencies may use to monitor their transportation costs and select the most cost-effective system suited to their needs. During pilot tests, the cost-accounting system was instrumental in helping service agencies analyze their transportation needs. Agencies without vehicles were then referred to agencies willing to share their vehicles under contract, or to existing



A woman in a wheelchair gets assistance from a driver in Portland, Ore., where small buses feature rear door lifts.

transportation firms.

Operating and management plans will also be designed during the project. The final phase of the study will be to design a detailed plan for an operational project which would implement a number of innovative solutions to the transportation problems encountered by elderly and handicapped persons who are served by social service agencies.

In the small city of Brockton, Mass., the Brockton Area Transit Authority has also been planning the coordination of social service agency transportation (MA-06-0078), although on a smaller scale than the projects in East Flatbush and Dallas County. Despite its smaller size, however, Brockton has been successful during FY 78 in coordinating the services of nearly 20 different agencies in the Brockton area which provide specialized transportation services to their clients. One goal of the project is to attempt to coordinate the services of the remaining agencies.

Agency transportation expenditures are often difficult to monitor because funding is derived from a wide variety of federal, state and local sources. This project involves the development of a demonstration plan, including a strategy to coordinate human service agency transportation services and resources to provide improved service and cost efficiencies.

The planning study will include centralization of administration, analysis of additional demand, and coordination of operations between the Brockton Area Transit Authority and other intercity transportation providers. Primary emphasis will be placed on the development of a



In Danville, Ill., elderly and handicapped patrons may buy tickets for transit and shared-ride taxis in advance, and pay only 11 percent of the actual cost.

management information system to ease the administrative problems involved in a coordinated transportation system.

The study project is expected to be completed by the end of February 1979, at which time local and federal officials will decide whether the final plan has potential for an actual demonstration project.

In New York's Lower East Side, a project conducted by the Vera Institute, Experimental Transportation for the Elderly and Disabled (NY-06-0053) will assess the costs and effectiveness of providing door-to-door transportation to the elderly

and disabled of an inner city area. Service is provided 12 hours per day, five days a week.

The project, known as EASYRIDE, began pilot operations in the summer of 1977 and now operates a fleet of 11 small buses of which six are equipped to accommodate four wheelchairs plus five additional passengers. The remaining five buses are designed to seat 15 passengers.

A unique aspect of the operation is the hiring of rehabilitated ex-offenders and ex-addicts to drive the vans. The project has received major funding from the

Department of Health, Education and Welfare, as well as from UMTA, to determine the impacts of mobility improvements on the quality of life and on the health care costs of the Lower East Side target population.

The project grantee, the Vera Institute of Justice, has received a federal waiver which allows elderly Medicare participants to receive Medicare reimbursements for EASYRIDE transportation to health destinations, such as medical facilities and nutritional centers. The waiver is the only transportation-related waiver of its kind that has been granted by the Department of Health, Education and Welfare to date.

During FY 78, the Vera Institute developed a system for coordinating agency transportation services and has succeeded in establishing several third-party contracts with human service agencies to provide service to their clients.

EASYRIDE has also tested a number of shuttle routes during FY 78, including two shuttles to hospital complexes which have proven to be very successful. During the fiscal year, productivity levels have increased to about 200 trips per day, the cost of trips has decreased, and operational improvements have been made.

The project is currently being studied as a model for the citywide paratransit system planned for New York City.

In Pittsburgh, Pa., research which was begun in 1975 at Carnegie-Mellon University culminated during FY 78 in a \$1.25 million grant to the Allegheny County Port Authority to conduct a two-year demonstration (PA-06-0042) of transportation brokerage as a means of coordinating paratransit services.

Presently, transportation for elderly and handicapped persons in the county is fragmented among numerous human service agencies and private operators who provide subsidized transit to eligible passengers.

Under the concept of transportation brokerage, the dispersed paratransit services would be coordinated under a single agent/broker. The broker is responsible for stimulating participation in the program through active marketing, coordinating the transportation needs and resources of clients, and ensuring the availability of all necessary dispatching and transportation resources.

In the fall of 1978, the authority contracted with a private Massachusetts consulting firm, Multisystems, Inc. of Cambridge, to serve as the actual agent/broker for the project. The project has been entitled ACCESS.

The role of the agent/broker will be to contract with the county's various cab companies and non-profit agencies that are willing to provide service under the ACCESS system. The broker will also contract with the county's numerous human service agencies that wish to hire paratransit services for their clients. Finally, non-agency affiliated handicapped persons who cannot use the regular transit system are eligible for a user-subsidy to purchase rides on the ACCESS system. The subsidy is in the form of tickets purchased at 25 percent of their face value.

During FY 78, the ACCESS system entered its initial start-up phase and contracts were initiated to provide services to several private agencies. The system will go into actual operation in late February 1979, as additional contracts are obtained

with other county agencies. Throughout the county, the ACCESS system has a potential market of between 20 to 30 human service agencies that may be interested in purchasing paratransit services for their clients.

The paratransit carrier network will be established by the agent/broker through the solicitation of bids from independent paratransit providers, including taxi companies, social service agencies, and special transportation agencies serving the handicapped. It is expected that the use of ride-sharing will help to diminish the cost of door-to-door service, both for the funding agencies and for the individual users.

User Subsidy Demonstrations

Another way in which UMTA has attempted to improve transportation for the elderly and handicapped in various cities is through directly subsidizing the cost of tickets purchased by those users, rather than subsidizing the transportation providers. User subsidies in the form of reduced bus or taxi fares are being tested by UMTA in demonstrations in Danville, Ill., Montgomery, Ala., Kinston, N.C., and Lawrence Mass. These projects are summarized in the accompanying table.

These cities offer a diversity of population sizes and transportation needs, and the subsidy demonstrations are tailored to fit the specific conditions of the cities in which they are being tested. Consequently, one purpose of the demonstrations is to test how well the user subsidy concept works under a variety of circumstances.

Special User Subsidy Demonstrations

CITY	POPULATION	ELDERLY AND HANDICAPPED POPULATION	TYPE OF SERVICE	SUBSIDY METHOD	PERCENT SUBSIDY TO SPECIAL USER
Montgomery, Alabama	135,000	21,000	Shared-ride taxi	Voucher	50
			Local bus	Tickets	50 peak periods 100 off-peak
Lawrence, Massachusetts	66,900	14,700	Shared-ride taxi	Tickets	50
			Local bus	Tickets	95
Kinston, North Carolina	22,000	3,000	Shared-ride taxi	Advanced sale tickets	50
Danville, Illinois	42,000	7,500	Fixed-route bus	Advanced sale tickets	89 special users
			Shared-ride taxi		78 general population

Other objectives include evaluating the operational and administrative requirements of user subsidy programs; determining whether user subsidies allow the elderly and handicapped to travel further and more widely; and examining the effects of subsidies on the quality of transportation services themselves.

A Test of the User Subsidy Concept in Developing a Small Citywide Transportation System: Danville, Ill.

One of the first user subsidy experiments in the nation was implement-

ed in 1975 in Danville, Ill. The City of Danville established a reduced fare system for the elderly and handicapped under which those groups could directly purchase shared-ride taxi tickets at 25 or 50 percent of actual cost.

The Danville demonstration (IL-06-0034), once the longest operating project of its kind, succeeded in attracting nearly 50 percent of the eligible population in the city to register for the service.

In FY 78, the city expanded the scope of the demonstration from a service exclusively for the elderly and handicapped

to a general user subsidy system designed to serve the entire population of the city.

Under the expanded system, private transportation operators are invited to bid for the contract to provide transportation services for the city. Under the contract, adult fares are limited to 40 cents, fares for elderly and handicapped passengers and students under 18 are set at 20 cents, and transfers are free. The contract also stipulates the subsidy amount that the city will pay for passengers and the number of different operators that the city will utilize.

In order to be eligible for the special 40

cent and 20 cent fares, users must purchase the subsidized tickets in advance. Tickets are available in Danville at 36 locations including all major banks, grocery stores and restaurants. Passengers who have not purchased the subsidy tickets are not eligible for the reduced fares, and the transit operators are allowed to propose unsubsidized cash fares. In order to protect both the city and the operators from incorrectly estimating potential ridership, the entire contract for service is rebid every four months.

During the first two bidding periods, a single provider was selected to implement service. The service was traditional, fixed-route transit on standard-size buses. During the third and fourth periods, a local taxi operator was also contracted to provide fixed-route and demand-responsive service in areas of low demand.

Cost per passenger on the standard-size bus system has ranged from as high as \$2.00 per trip at the beginning of the project, to \$1.65 per trip under the most recent contract. Cost per passenger on the demand-responsive system has been \$1.50 per trip.

According to city officials, transit productivity under the user subsidy system is increasing, while the cost per trip is declining.

As the experiment continues, officials hope to examine the reaction of the public to an advanced-purchase ticket system and to study the amount of administrative work involved in operating a large ticket distribution system.

West Virginia TRIP Program

The Transportation Remuneration Incentive Program (TRIP) of West Virginia

(WV-06-0008) has three major objectives: to provide increased transportation buying power for low-income elderly and handicapped people; to help support existing transportation providers in West Virginia; and to help expand and develop transportation throughout the rural, mountainous state of West Virginia.

The TRIP program is composed of a ticket subsidy program and the development of a viable transportation network in pilot regions of the state.

West Virginia was chosen as the site of this demonstration project because of the unique characteristics of the state. Twenty-three of 55 counties in West Virginia had virtually no public transportation available. The state is predominantly rural, with the bulk of the population scattered across rugged Appalachian terrain; economic conditions leave some 20 percent of the population with no private transportation; and during recent years, the elderly population has nearly doubled.

Due to the lack of a state department of transportation, the West Virginia Department of Welfare was designated to administer the program.

For \$1.18 each month, the ticket subsidy program provides low-income elderly and/or handicapped persons with a transportation ticket book actually valued at \$8.00. The TRIP tickets may be used to purchase transportation services from participating providers in the state.

The other element of the TRIP program is the development of a multifaceted network of primary and feeder transportation systems. The network includes inter-city carriers, taxi operations, and public and private transit operations.

Of the ten transportation regions in the state, five are actively participating in the TRIP program.

Within each region, a TRIP primary network of conventional, fixed-route bus service utilizing mini- and mid-sized vehicles was developed. In FY 78, experience indicated that fixed-route service was not working, and regions began to reassess service plans to tailor them more closely to the needs and demands of users. A greater emphasis has been placed on demand-responsive service modes.

Study of Inner City Transportation

The objective of this study (IT-06-0153) is to determine the travel desires and mobility needs of an inner city neighborhood and to develop appropriate transit operating services, techniques, institutional frameworks and financial arrangements to satisfy those transportation needs and desires.

The major features of this project include a literature search of inner city transportation experiences, data collection on the transportation characteristics of inner city residents, and an analysis of inner city transportation deficiencies by trip purpose.

Alternative inner city transportation solutions will be developed, including types of transportation services, financial plans, and institutional arrangements. Three demonstration concepts, representing the most promising alternatives, will be selected and developed into site-specific project designs. A final report on the project is expected.

Transportation Services for Special User Groups

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
ACCESSIBILITY PROGRAMS						
Research on the Transportation Problems of the Transportation Handicapped	NY-06-0054	\$1,900,000	Oct. 1976- Oct. 1979	Grey Advertising, Inc.		Patricia Cass (202)426-4984
Evaluation of Accessible Full-Size Bus Services	MA-06-0049	\$275,000 (est.)	Feb. 1977- Jan. 1980		TSC	Lynn Sahaj (202) 426-4984
Total Accessibility Demonstration, Palm Beach County, Florida	FL-06-0015	\$689,000	June 1977- Jan. 1980	Palm Beach County Transportation Authority, Fla.	TSC; Multisystems, Inc.	Lynn Sahaj (202) 426-4984
Total Accessibility Demonstration, Champaign-Urbana, Illinois	IL-06-0039	\$502,404	July 1977- Sept. 1980	Champaign-Urbana Mass Transit District, Ill.	TSC	Larry Bruno (202) 426-4984
An Elderly and Handicapped Service Approach for a Medium Sized City	OR-06-0004	\$916,768	Dec. 1976- June 1979	Tri-County Metropolitan Transportation District of Oregon	TSC; Crain and Associates	Lynn Sahaj (202) 426-4984
COORDINATED SERVICES						
Elderly and Handicapped Social Service Coordination Demonstration	NJ-06-0008	\$195,960	Nov. 1977- Nov. 1979	Mercer County, N.J.	TSC; ARI, Inc.	Mary Martha Churchman (202) 426-4984
Coordinated Services for the Handicapped, New York City	IT-06-0154	\$109,340	Oct. 1976- May 1979	Tri-State Regional Planning Commission; New York City Planning Commission		Larry Bruno (202) 426-4984
Planning and Analysis for Special Service Transportation Coordination	TX-06-0025	\$79,306	July 1977- July 1978	City of Dallas, Tex.	TSC	Lynn Sahaj (202) 426-4984

Transportation Services for Special User Groups

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
COORDINATED SERVICES						
Coordination of Human Service Transportation	MA-06-0078	\$40,000	March 1977-Feb. 1979	Brockton Area Transit, Mass.	TSC	Larry Bruno (202) 426-4984
Vera Institute Experimental Transportation for the Elderly and Disabled	NY-06-0053	\$175,000	Jan. 1977-Jan. 1981	Vera Institute of Justice	TSC; ARI, Inc.	Lynn Sahaj (202) 426-4984
Ride-Sharing Paratransit Agency Study	PA-06-0035	\$139,000	Jan. 1977-Dec. 1979	Carnegie-Mellon University		Lynn Sahaj (202) 426-4984
Implementation of an Agent/Broker to Coordinate Paratransit Services, Allegheny County, Pa.	PA-06-0042	\$1,250,000	July 1978-July 1980	Allegheny County Port Authority, Pa.	Charles River Associates	Lynn Sahaj (202) 426-4984
USER SUBSIDIES						
User-Side Subsidy Demonstration	IL-06-0034	\$977,000	June 1975-Aug. 1979	City of Danville, Ill.	TSC; Crain and Associates	Larry Bruno (202) 426-4984
User-Side Subsidy for the Elderly and Handicapped	AL-06-0003	\$518,405	Nov. 1976-April 1979	City of Montgomery, Ala.	TSC	Larry Bruno (202) 426-4984
User Subsidy for the Elderly	MA-06-0076	\$422,061	Aug. 1978-Feb. 1980	City of Lawrence, Mass.	TSC; Charles River Associates	Larry Bruno (202) 426-4984
User Subsidy for the Elderly and Handicapped	NC-06-0063	\$213,529	July 1977-July 1980	City of Kinston, N.C.	TSC; Charles River Associates	Lynn Sahaj (202) 426-4984
OTHER PROJECTS						
West Virginia TRIP Program	WV-06-0008	\$720,000	Sept. 1976-July 1979	West Virginia Dept. of Welfare	TSC; Crain and Associates	Lynn Sahaj (202) 426-4984
Study of Inner City Transportation	IT-06-0153	\$150,000	Feb. 1976-Jan. 1979	Transportation Assistance, Inc.	TSC	Larry Bruno (202) 426-4984

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

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Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

Study of the Transportation Problems of the Transportation Handicapped, Off-Peak Half-Fare Study

Proj. NY-06-0054
July 1976, PB 268-867/AS

Study of the Transportation Problems of the Transportation Handicapped, Off-Peak Half-Fare Study: Ten Case Studies

Proj. NY-06-0054
Grey Advertising, Inc.
October 1976, PB 263-868/AS

Summary Report of Data From National Survey of Transportation Handicapped People

Proj. NY-06-0054
June 1978

Technical Report of National Survey of Transportation Handicapped People

Proj. NY-06-0054
October 1978

Service and Methods Demonstration Program Annual Reports

Proj. MA-06-0049
Transportation Systems Center
November 1975, PB 251-325/AS
April 1977, PB 270-673

Evaluation Guidelines for Service and Methods Demonstration Projects

Proj. MA-06-0049
Transportation Systems Center and CACI, Inc.
February 1976, PB 251-891/AS

Incidence Rates and Travel Characteristics of the Transportation Handicapped in Portland, Oregon: Final Report

Proj. OR-06-0004
Crain and Associates
April 1977, PB 269-859

TRIMET: Automated Fare Billing System

Proj. OR-06-0004
MITRE Corporation/METREK Division
December 1977, PB 275-661/AS

The Lift: Special Needs Transportation in Portland, Oregon: Interim Report

Proj. OR-06-0004
Crain and Associates
June 1978, UMTA-OR-06-0004-78-2

Handicapped and Elderly Vertical Movement Assessment Study

Proj. MA-06-0047
Transportation Systems Center
February 1976, PB 252-516/AS

Transportation Problems of the Transportation Handicapped

Proj. CA-06-0092
Crain and Associates
August 1976

Vol. I, **The Transportation Handicapped Population Definition and Counts**, PB 258-579/AS
Vol. II, **The Roles of Government and the Private Sector in the Provisions of Mobility Systems for the Transportation Handicapped**, PB 258-580/AS

Vol. III, **Alternative Planning Methodologies**, PB 258-581/AS

Vol. IV, **Transportation Solutions for the Handicapped**, PB 258-582/AS

Coordinating Transportation for the Elderly and Handicapped: A State of the Art Report

Proj. DC-06-0106
The Institute of Public Administration
November 1976, PB 265-079/AS
Special Transportation Services for the Elderly and Handicapped Demonstration Project, Baton Rouge, Louisiana
Proj. LA-06-0001
CACI, Inc.
November 1976, PB 263-904/AS

City of Cleveland Neighborhood Elderly Transportation Project, Dial-A-Bus: Interim Report

Proj. OH-06-0018
City of Cleveland
January 1976, PB 253-237/AS

Cleveland Neighborhood Elderly Transportation Demonstration Project: Final Report

Proj. OH-06-0018
Crain and Associates
April 1977, PB 269-860

User Side Subsidies for Shared Ride Taxi Service in Danville, Ill.: Phase I

Proj. IL-06-0004
June 1977, UMTA-IL-06-0034-77-1

Fare and Pricing Policies

Trends and Highlights



The main objective of the Pricing and Policy Division within UMTA's Service and Methods

Demonstration Program is to increase transit ridership levels, thereby improving the productivity of a transit system. Adjusting fares and providing special service options can increase ridership in certain market segments. Rather than determining fare policies on the basis of user demand and operating subsidy levels, the current pricing program is examining the impact of actions aimed at particular market segments which demonstrate a high potential for increased ridership.

Three transit improvement demonstrations are now underway, providing people with packages of incentives to use public transportation instead of their automobiles. In addition, fare prepayment programs are making it more convenient for people to use transit regularly. Free fare during off-peak periods increases ridership.

Three research and design studies investigating alternative transit transfer policies, the feasibility of self-service and automatic fare-billing systems, and a promotional transit fare incentive plan are underway to determine still other ways of attracting and increasing transit patronage. Two transit resource productivity demonstrations are providing new tools and techniques for resource allocation and for analyzing ridership and operating cost data. A study on attitude measurement techniques for transportation planning and evaluation will recommend attitudinal measurement techniques to evaluate public response to transportation innovations.

In addition, a conference on research and operational experience in multimodal pricing and related service improvements was held. During the conference, key pricing policy issues were discussed by a mix of transportation professionals from research and consulting firms, and industry operators, leading to recommendations for future pricing demonstration activities.

Transit Improvement Demonstrations

One way to increase transit ridership levels is to divert auto users to transit. Three demonstration projects have recently been funded to investigate the effects of various transit improvements on the productivity of conventional transportation systems. These transit improvements are designed to provide incentives to use public transportation.

In Knoxville, Tenn., a Fare-and Service Improvement Demonstration (TN-06-0006) is being developed in order to show whether a package of service and fare innovations can enhance the effectiveness of ongoing transportation programs and improve the role of the transportation broker. The proposed project consists of five price and service demonstration phases, with each phase catering to a specific transit market segment and to the resolution of a specific urban transportation problem. The effects of each demonstration phase will be largely independent of the others except to the degree that each phase has a cumulative effect on increasing systemwide transit ridership to downtown activity centers and providing an integrated public transportation system for improving the

mobility of the general public.

The first phase would create a central business district (CBD) fare-free zone. This would improve mobility in the CBD and reduce dependence upon private automobiles. The fare-free zone would attract new patrons to the regular route and express bus system.

The second phase would improve downtown transit traffic flow by integrating the existing traffic circulation plans, transit routing plans, and the transit fare-free zone into one compatible coordinated plan. The prime consideration will be to improve downtown circulation of the transit service and to reduce duplication of routes.

The next phase will provide for merchant validation of shoppers' free-fare vouchers in order to increase the number of people shopping in the downtown area by transit. This program should increase off-peak public transportation ridership, establish a trade-off between public transportation and parking subsidies, and reduce dependence on CBD parking to attract customers.

An expanded fare-free zone would improve the accessibility of the CBD to nearby activity centers. In addition, the expanded zone could serve as a substitute for downtown parking spaces by encouraging parking on the fringe of the CBD.

The last phase would extend transit service to low density suburban areas through the use of coordinated fare programs. The quality of public transportation in low density areas would improve, and it is expected that new riders would be attracted to the existing public transit and downtown activities.

The Price and Service Improvements Demonstration in Vancouver, Wash. (WA-06-0010) will encourage motorists using the congested Portland/Vancouver I-5 highway corridor to shift to transit by carefully controlling expansion of transit service and the timely reduction of fares. The effects of these actions will be assessed to determine the modal shift from automobiles to transit. In addition, the impact of marketing such transit improvements will be assessed and compared to the cost of providing the improved service and reduced fares.

The project is to be implemented in four phases. Each phase is designed to provide a logical sequence of improved transit service in the corridor. The first two phases will be implemented within the first year of funding. The implementation of the latter two phases is contingent upon the subsequent approval of the second year funding.

Phase I involves market research and the selection of park-and-ride lots. Market research will enable the selection of transit service improvements which can effectively serve the corridor travel market. A promotion of existing transit service will also be developed. Phase II would implement these selected transit improvements and identify bus preferential treatment techniques to improve bus operations. The impact of the service modifications will be reviewed.

The ongoing transit promotion program would be supplemented with a fare reduction and the implementation of the bus preferential treatment techniques in Phase III. Phase IV would extend routes from downtown Vancouver in order to reach more potential users. Based upon

the route extensions identified, additional park-and-ride facilities will be explored.

The Parking Pricing Demonstration in Madison, Wis., (WI-06-0006) would initiate a series of transit pricing and service improvements as well as new price and space allocations for parking in the downtown areas. The objectives of this project are to increase the availability of short-term parking in the central city, encourage high occupancy of autos using long-term parking in the central city, and promote the use of mass transit during the peak travel hours, especially for central city employees.

Fare Prepayment Programs

Transit fare prepayment involves purchasing evidence in the form of passes, permits, tickets, tokens, etc. which can later be verified as a substitute for cash payment for transit rides. Prepayment is intended to make it more convenient for people to use transit. Existing transit users are encouraged to use transit more regularly, and new users are being attracted, although in fewer numbers than formerly projected. Prepayment also intends to give the transit operator a cash flow advantage.

The objective of the Transit Fare Prepayment Study (MD-06-0031) is to develop demonstration plans for four transit fare prepayment concepts: intermodal/interagency coordination; student pass plan; off-peak fares; and user preference. Background research and concept development have been completed. The site selection process is

well under way, and it is anticipated that two projects will be developed in FY 79. One project will demonstrate the use of transit fare prepayment as a means of promoting intermodal/interagency coordination in a region or part of region served by more than one transit operator or mode. The other project will develop a student pass plan, designed to increase the number and frequency of students using transit.

In Austin, Texas, a Transit Fare Prepayment with Reduced Price Promotion program (TX-06-0021) has been under way since May 1977. Two one-month sale periods were offered to promote the plan. In October 1977, discounts of about forty percent were offered on monthly passes and twenty-trip punch cards. Sales of the prepaid tickets in that month were almost four times more than in the previous, non-discount month. The second sale at 20 percent discount in March 1978 increased sales by three times that of the previous month's sales. A final evaluation report is now being prepared. Preliminary results indicate that pass sales and trips by pass users increased during the promotion months based on the discount rates. Due to the small proportion of pass users and distribution methods, however, it was found that cash flow did not enhance the operator's position significantly.

A similar Transit Fare Prepayment with Reduced Price Promotion demonstration is under way in Phoenix, Ariz. (AZ-06-0002). This demonstration also involves the use of temporary discounts on transit fare prepayments to attract new ridership and to induce existing riders to change from cash fares to fare prepayment. Results of the first sale, at 20

percent discount, pose some questions as to the ability of transit fare prepayment programs to attract and hold new transit riders. The second sale, at 40 percent discount, began at the end of FY 78. From the results, it is hoped that the numbers of new riders and those switching from cash to prepayment can be determined, as well as the public's reaction to the transit sales, user preference to different types of prepayment mechanisms, and the cost-effectiveness of the sales promoting transit fare prepayment.

Two programs of transit fare prepayment through employers are currently under way in Jacksonville, Fla. (FL-06-0016) and Sacramento, Calif. (CA-06-0102). These demonstration projects will make passes more available to a greater number of people, and are designed to develop a partnership between the transit operator and local employers. The benefits to the transit operator are decreased fare collection costs and increased ridership and revenue. The employer can save money by sharing the cost of the employees' transit passes rather than providing subsidized parking. Much of the work in these projects is to evaluate the results of these joint ventures between the transit agencies and the business community.

In Jacksonville, a pass discount was offered in order to increase transit ridership on the existing bus system without major modification of services. The bulk of the work involves contacting the employers and preparing data collection methods conducting surveys of employees, and distributing the passes while emphasizing a payroll deduction plan. A fare increase in October 1978 resulted in the postponement

of transit fare prepayment instruments to employers until January 1979.

The demonstration in Sacramento will measure the impact of using various methods of marketing monthly passes through employers on prepaid pass sales and transit ridership. A three-month discount pass sale was initiated at the end of FY 78. Employees of 52 participating businesses were eligible to take advantage of a 25 percent reduction in the price of a monthly bus pass.

Fare-Free Off-Peak Transit Service

Fare-free off-peak transit service is another way to increase transit ridership by acquainting non-users and people who seldom use public transportation with the availability of transit service. Fare-free off-peak service can improve the public's perception of public transportation, facilitate mobility in congested downtown areas, and increase the activity in centers being served.

Beginning in June 1977, a fare-free off-peak demonstration program was undertaken in Trenton, N.J. (NJ-52-0001). Preliminary results show that ridership on the bus system has increased about 50 percent in the off-peak hours, with a 10 percent overall system-wide ridership gain. The biggest impact has been on discretionary travel. Incidents of "joyriding" and vandalism were disrupting the service early in the program. However, such incidents have been on the decline since the spring of 1978. Another extensive data collection effort in the fall of 1978 will provide an opportunity for a comprehensive analysis of the impacts.



Buying bus passes in Austin, Tex., is both convenient and economical.

In Denver, Colo., an Off-Peak Fare-Free Transit Demonstration (CO-06-0010) involves fare-free service to all transit users from 6 p.m. to 6 a.m. and 8 a.m. to 4 p.m., Monday through Friday, and all day Saturday, Sunday, and holidays. The objectives of this program are to increase the productivity of the bus fleet through increased off-peak ridership,

to determine the cost effectiveness of off-peak fare reductions, to increase the public awareness of the transit system, and to evaluate the impact of the reinstatement of fares on February 1, 1979. Current work involves the final design of telephone and on-board survey instruments to measure the impact of the demonstration on both users and non-users.

In Albany, N.Y., a CBD Off-Peak Fare-Free Transit Program (NY-06-0064) was begun during FY 78. This project will provide an opportunity for coordinating the implementation and operation of a fare-free zone with downtown business organizations. In addition, downtown improvement programs for enhancing activity centers will be identified, and interagency cooperation will be encouraged to stimulate activity for a stagnating downtown area. The project is also expected to improve mobility in the downtown area; attention will be given to determining traffic volumes and speeds.

The four stages in this project are planning, operation, marketing, and evaluation. In the planning stage, transit service in the fare-free zone will be reviewed with the objective of providing higher frequency by staggering transit trips that are clustered. The fare-free operation will be in effect for 24 months. A fare collection strategy — at first a system for monitoring fare-paying passengers, then an honor system where riders would self-identify their origin and destination points — would be put into effect. A marketing plan will focus on providing project information to various market segments and providing high project visibility to potential fare-free transit users within the zone. The evaluation phase will attempt to identify any progress in the areas of downtown revitalization, traffic volumes and speeds, fare-paying passenger volume, the public image of transit, and intra-CBD mobility.

Research and Design Studies

Three different studies are underway to investigate various ways to attract and increase transit patronage. The first is examining and evaluating alternative transit transfer policies. The second study is determining the feasibility of self-service and automatic fare-billing systems. The third study is investigating promotional transit fare incentives, that is, a system of giving all bus patrons a token exchangeable for goods and services by local merchants.

The objective of a Transfer Policy and Cost Study (MA-06-0049) is to investigate cost, ridership, revenue, and user satisfaction as a consequence of alternative transfer policies. The wide variety of transfer strategies and charges in effect at various transit agencies across the country, as well as alternatives such as routing, passes, and route simplification were investigated. A review of transfer-related literature has been completed, as well as identification of the research issues associated with the study of transit transfer policies. Representative of several transit properties will be interviewed in detail on their transfer policies, in the first quarter of FY 79.

A Self-Service/Automatic Fare Billing Demonstration Design (VA-06-0049) was initiated to determine the feasibility of using self-service fare collection and cancellation, which would rely on the honor system, and automatic fare billing, that is, credit card systems on public transportation. This study seeks to demonstrate the value of such systems for

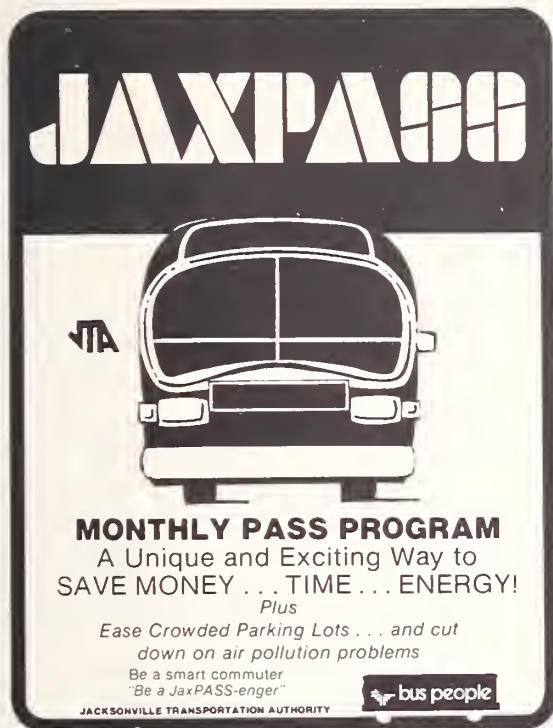
implementing flexible fare structures, establish whether there is improved operating efficiency resulting from the implementation of these systems, and ascertain the public response to each of the systems. Initial concept analysis and a review of current self-service fare collection techniques began at the end of FY 78.

A Promotional Transit Fare Incentives Demonstration Design (PA-06-0047) will develop a major urban demonstration program of "reinforcement theory" approaches to transit promotion. Incentives in the form of a token exchangeable for goods and services by local merchants would be given to all bus patrons. Initially, a critical review will be undertaken of the current state-of-the-art of transit promotion in general and, specifically, promotion strategies evolving from the reinforcement theory. From this research, suggestions as to which reinforcement theory procedures might be best applied to a major urban area will be proposed. Finally, a site for an urban demonstration will be selected.

Transit Resource Productivity Demonstrations

Two transit resource productivity demonstrations have recently begun, one by Metro Area Transit in Omaha, Neb., (NE-06-0003) in September 1978, and the other by the Central Ohio Transit Authority (OH-06-0027) in October 1978.

The primary purpose of these projects is to give both the operating and policy-making levels of management a set



In Jacksonville, Fla., the pre-paid monthly pass program was widely advertised on posters like the one shown here.

of effective analytical tools by which to assure the efficient allocation of resources as called for in a Transit Development Plan (TDP). In addition, new, inexpensive techniques and procedures for collecting and analyzing information about the details of ridership and operating costs of each route will be developed. The objectives of these demonstrations include: 1) to form specific transit system goals and

objectives; 2) to devise criteria for measuring individual route performance; 3) to increase the utility and availability of marketing information to management; and 4) to improve the productivity of all resources devoted to transit operation. These projects will be part of a series of demonstrations that will eventually provide regional, state, and federal planners and program managers with uniform and specific measures of productivity and transportation objective fulfillment.

Attitude Measurement

The purpose of the Attitude Measurement Techniques for Transportation Planning and Evaluation study (DOT-TSC-1168) is to develop better analytical techniques for measuring public responses and attitudes toward transportation improvements and demonstrations. The study will have a two-fold impact. It will recommend to transportation planners and systems operators specific attitudinal measurement techniques which can be used to evaluate responses to planned or implemented transportation innovations, and it also will validate the methodological bases of attitude measurement techniques, thereby designating the range of applications in which these procedures are useful.

In 1978, site evaluations were conducted in a user-side subsidy demonstration in Danville, Illinois. Before and after data were collected for assessing attitudes towards service changes of paratransit and fixed-route transit facilities. A final report analyzing the attitudinal data collected will be forthcoming.

Fare and Pricing Policies

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
TRANSIT IMPROVEMENT DEMONSTRATIONS						
Fare and Service Improvement Demonstration	TN-06-0006	\$450,000	Nov. 1978- June 1981	City of Knoxville, Tenn.	TSC; Multisystems, Inc.	Vince Milione (202) 426-4984
Price and Service Improvements Demonstration	WA-06-0010	\$300,000	June 1978- March 1980	City of Vancouver, Wash.	TSC; Systan, Inc.	Vince Milione (202) 426-4984
Parking Pricing Demonstration	WI-06-0006	\$1,496,221	Oct. 1978- Aug. 1980	City of Madison, Wis.	TSC	Stewart McKeown (202) 426-4984
FARE PREPAYMENT PROGRAMS						
Transit Fare Prepayment	MD-06-0031	\$79,633	July 1977- June 1979	Ecosometrics, Inc.	N/A	Stewart McKeown (202) 426-4984
Transit Fare Prepayment with Reduced Price Promotion	TX-06-0021	\$125,081	May 1977- Oct. 1978	City of Austin, Tex.	TSC; Crain and Associates	Vince Milione (202) 426-4984
Transit Fare Prepayment with Reduced Price Promotion	AZ-06-0002	\$116,963	July 1977- Feb. 1979	City of Phoenix, Ariz.	TSC; Crain and Associates	Stewart McKeown (202) 426-4984
Demonstration of Various Transit Fare Prepayment Instruments Through Employers	FL-06-0016	\$185,000	Sept. 1977- Feb. 1980	Jacksonville Transportation Authority, Fla.	TSC; Charles River Associates	Vince Milione (202) 426-4984
Transit Fare Prepayment Through Employers	CA-06-0102	\$144,300	June 1977- Dec. 1979	Sacramento Regional Transit, Calif.	TSC; Systan, Inc.	Stewart McKeown (202) 426-4948

Fare and Pricing Policies

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
FARE-FREE OFF-PEAK TRANSIT SERVICE						
Fare-Free Off-Peak Transit Service	NJ-52-0001	\$625,000	June 1977-March 1978	New Jersey Department of Transportation	TSC; DeLeuw Cather and Co.	Vince Milione (202) 426-4984
Off-Peak Fare-Free Transit Demonstration	CO-06-0010	\$3,400,000	March 1978-June 1979	Denver Regional Transportation District, Colo.	TSC; DeLeuw Cather and Co.	Stewart McKeown (202) 426-4984
CBD Off-Peak Fare-Free Transit	NY-06-0064	\$407,380	June 1978-Jan. 1981	Capital District Transportation Authority, Albany, N.Y.	TSC; Cambridge Systematics, Inc.	Vince Milione (202) 426-4984
RESEARCH AND DESIGN STUDIES						
Transfer Policy and Cost Study	MA-06-0049	\$77,500	Oct. 1977-May 1978	TSC; Charles River Associates	N/A	Stewart McKeown (202) 426-4984
Self-Service/Automatic Fare Billing Demonstration Design	VA-06-0049	\$375,893	Sept. 1978-Sept. 1980	MITRE Corporation	N/A	Stewart McKeown (202) 426-4984
Promotional Transit Fare Incentives Demonstration Design	PA-06-0047	\$57,864	June 1978-March 1979	Pennsylvania State University	N/A	Vince Milione (202) 426-4984
TRANSIT RESOURCE PRODUCTIVITY DEMONSTRATIONS						
Transit Resource Productivity Demonstration	OH-06-0027	\$352,000	Oct. 1978-Feb. 1980	Central Ohio Transit Authority	TSC	Stewart McKeown (202) 426-4984
Transit Resource Productivity Demonstration	NE-06-0003	\$291,500	Sept. 1978-Jan. 1980	Metro Area Transit, Omaha, Nebr.	TSC; Cambridge Systematics, Inc.	Vince Milione (202) 426-4984

Fare and Pricing Policies

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
ATTITUDE MEASUREMENT						
Attitude Measurement Techniques for Transportation Planning and Evaluation	DOT-TSC-1168	\$177,456	July 1976- July 1978	TSC; Abt Associates, Inc.	N/A	Vince Milione (202) 426-4984

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Albany CBD Fare-Free Demonstration: Evaluation Plan

Proj. NY-06-0064
Cambridge Systematics, Inc.
August 1978

The Consequences of Transit Fare and Service Policies: A Classified Bibliography

Proj. DC-06-0120
The Urban Institute
April 1976, PB 253-101/AS

Low Fare and Fare-Free Transit: Some Recent Applications by U.S. Transit Systems: Interim Report

Proj. DC-52-0002
The Urban Institute
February 1977, PB 271-077

Plan for a Demonstration of Means for Measuring Transit Resource Productivity and Adjusting Services or Revising Routes in Omaha, Nebraska

Proj. NE-06-0003
Institute of Public Administration

Plan for Demonstration of Transit Fare Prepayment Promoted by Employers in Jacksonville

Proj. FL-06-0016
The Urban Institute
December 1977, 5066-6-4

The San Diego Transit Corporation: The Impact of Fare and Service Changes on Ridership and Deficits, 1972-1975

Proj. DC-52-0002
The Urban Institute
May 1977, PB 275-009/AS

The San Diego Transit Study Data Base: Reference Manual

Proj. DC-52-0002
The Urban Institute
June 1977, PB 275-010/AS

Transit Fare Prepayment

Proj. MA-06-0049
The Huron River Group, Inc.
August 1976, PB 265-227/AS

Service and Methods Demonstration Program Annual Report

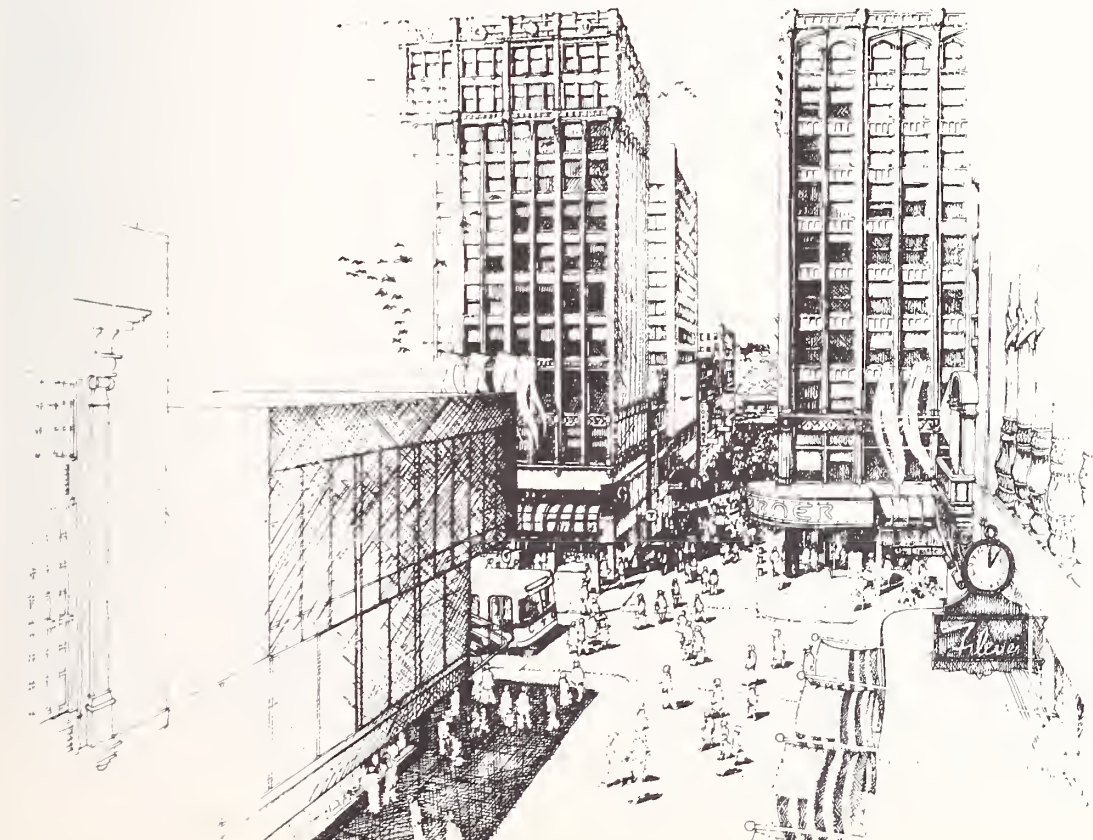
Proj. MA-06-0049
Transportation Systems Center
November 1975, PB 251-325/AS
April 1977, PB 270-673

Vancouver, Washington: Transit Service Demonstration Management Plan

Proj. WA-06-0010
The Urban Institute

Conventional Transit Service Innovations

Trends and Highlights



Innovative demonstration projects for conventional transit service have the longest history of success in the Service and Methods Demonstration area. For the most part, attention in conventional transit service has been shifting from the radial corridor to suburban, downtown shopping, and business district trips.

Revitalization efforts and the subsequent resurgence of many downtown areas have often been accompanied by transit projects in the CBD. Examples of this resurgence include the skywalk system in Minneapolis, Renaissance Center in Detroit, Pioneer Square and Pier 99 in Seattle, and Quincy Market-Faneuil Hall in Boston.

To encourage and assist urban revitalization efforts, transit projects have been designed to study the development of auto restricted zones, transit malls, and priority treatment of buses in downtown areas. Studies and research are also being conducted to evaluate the efforts of demonstration projects. Many of these projects are designed to de-emphasize or discourage the use of automobiles in congested portions of cities. Many of the projects are also intended to improve the environment and the aesthetic atmosphere, promote economic growth, restructure traffic and pedestrian circulation, or to improve transit service.

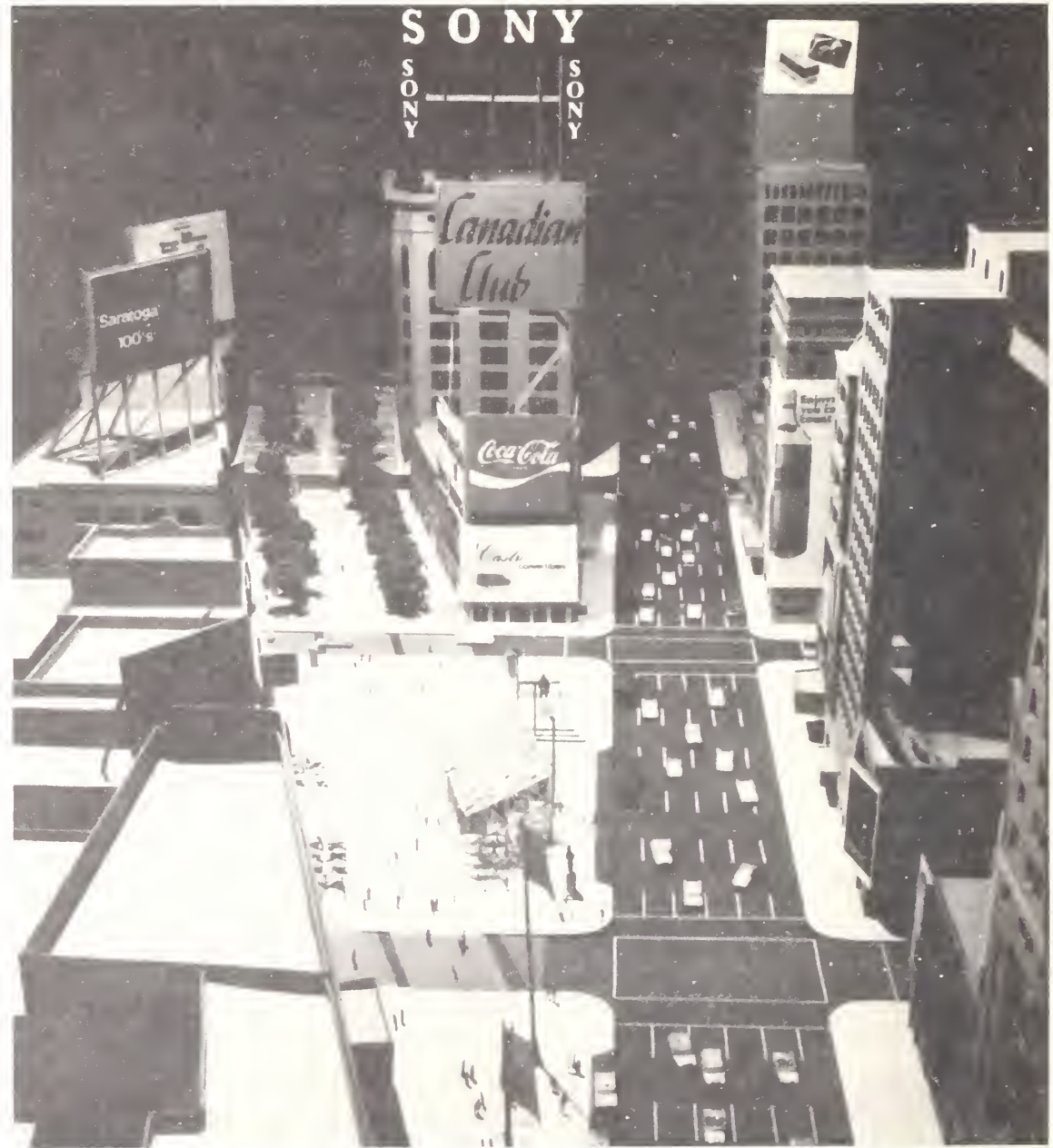
Transit Malls

Transit malls usually consist of one or two streets from which automobile and truck traffic is completely or mostly banned. Sidewalks are widened, amenities added, and a narrow roadway is usually designed for efficient bus operation within the mall. Parts of the mall may be reserved for pedestrians only.

Transit malls are generally planned as part of a scheme of downtown redevelopment and often include transit improvements adjacent to the mall, auto restrictions, and parking modifications. Major issues involved in planning transit malls include the environmental, aesthetic, and safety problems of mixing transit and pedestrian uses, the best physical designs for transit operations, the effects on automobile traffic, and the economic impacts on businesses located on or near the mall.

A large scale revitalization project, Broadway Plaza Transit Mall (NY-06-0056), is planned for New York City's famous and congested Times Square. Included as a major part of the project is the redesign of Broadway, an important cross link in the area's street pattern, to include a transit mall, pedestrian plaza, and priority treatment of buses on adjacent streets.

The transformation of Broadway into Broadway Plaza will include complete street closings, progressive sidewalk widenings and a transitway on Broadway between 49th and 45th Streets. As streets are closed and private vehicles diverted, an open pedestrian plaza will be created, free of all but emergency vehicles, and a transitway approaching and abutting the plaza will be built. The plaza will be directly



New York City's famous Times Square might resemble this architect's rendering if the proposed Broadway Transit Plaza is constructed.

served by transit and taxi passenger loading areas.

A Transit Information Center, featuring a coordinated map and graphics display, will serve to make the plaza a center for transit service and tourist information, and will help to attract new patrons to the transit system. In addition, the plaza will include shops, services and other businesses in the district. A major, new, 54-story 2,000-room hotel is being planned to front on the plaza.

Transit Mall Study

Beginning in mid-1976, UMTA funded a study of transit malls (DOT-TSC-1081) in seven different cities. The second phase of the study investigated three of those cities, Minneapolis, Minn., Philadelphia, Pa., and Portland, Ore., in detail.

The study attempted to relate the cost-effectiveness of the transit mall projects to their individual components in order to provide guidance in the planning and design of future malls. Results were examined against the objectives of transit malls in improving transit service; increasing efficiency of transit operations; encouraging transit ridership; discouraging auto use; reducing conflicts among autos, trucks, transit, and pedestrians; creating or improving an environment for pedestrian and street activity; and promoting economic growth and activity.

Preliminary results of the study showed that transit malls or downtown "bus only" streets have a major positive impact on the revitalization of downtown business and shopping areas. Effects on transit have also been good with definite improvements in transit reliability and transit marketing, although the study did not

reveal any significant change in average transit travel time.

Auto Restricted Zones

The auto restricted zone (ARZ) is similar in concept and design to the transit mall. The major difference is that the ARZ generally includes a more extensive area, or, at the very least, side streets leading to and from a larger, centrally located and similarly restricted roadway. An ARZ, like a transit mall, can be created through the use of either parking restrictions, barriers to traffic, or prohibition of all automobile traffic.

After three years of study and planning of auto restricted zones, FY 78 saw the beginning of actual demonstrations. Three auto restricted zone projects (Boston, Mass., Memphis, Tenn., and Providence, R.I.) were either constructed or in their final planning stages.

An auto restricted zone was developed in Boston to demonstrate the feasibility of the ARZ concept (MA-06-0089). In this program, scarce street space was partially restricted in the downtown shopping district to better serve the needs of pedestrians, transit services, merchandise shipment, taxis and private autos. The project has three basic components: 1) redesigned circulation system for buses, 2) physical reconstruction to reserve streets for pedestrians, and 3) a one-year program to subsidize extended bus operations.

Preliminary reports on the zone, since its opening on September 5, 1978, indicate that the program has been well received by pedestrians, the media, transit patrons and

most merchants. The anticipated major traffic tie-ups on the periphery of the zone did not materialize. The city has issued over 70 special permits for delivery vehicles within the zone.

A grant (TN-06-0008) was awarded in the last quarter of FY 78 to conduct and evaluate a program that combines the development of an auto restricted zone with improvements to the City of Memphis' transit system. Improvements to Memphis' transit operations will be made by upgrading transit stops, developing a downtown transit terminal and instituting a high frequency/low fare shuttle bus service between the downtown ARZ and the highly populated medical center.

A parallel purpose of this grant is to support the downtown revitalization program which began with a locally sponsored pedestrian mall.

The City of Providence, R.I. plans to develop an auto restricted zone in conjunction with central business district revitalization and transit service improvements. An UMTA grant (RI-06-0010) of \$960,000 out of \$5,000,000 required for the total project was awarded to Providence in 1978.

With goals similar to those sought in Boston's ARZ program, a large pedestrian plaza will be constructed. In addition, transit service improvements will be made, including a revamped bus routing system to allow for through downtown routing and the construction of a major 12-berth downtown bus terminal and a small transit mall. The ARZ and transit improvement project are scheduled to begin construction in 1980.

Vehicle Innovation

The use of the nation's waterways, particularly to transport commuters, could serve to reduce the pressures on existing highways and mass transit facilities. A waterborne demonstration project in New York City (NY-06-0055) will determine consumer and general community acceptance of such service in the metropolitan area. In addition, information will be provided on the economics of the service, operational problems, and recommendations for improvements in the design of the craft.

Three high-speed surface vessels, like the Hovercraft, will be leased and put into service to provide a variety of services design of the craft. A variety of services will be tested.

Innovative Studies

Work in the area of transit reliability has shown that reliable transit service is even more important to travelers than travel time and travel cost. Fewer people will use unreliable service if other forms of transportation are available. available, even if the other forms cost more.

The study includes an in-depth analysis of service reliability and travel behavior, reliability from the transit operator's perspective, measures of reliability, causes of poor reliability and strategies to improve reliability. Also included is an overview of future studies needed to gain a better understanding of the impact of reliability on travel operations and behavior.

This study will develop a report in 1979, which will present an overview of transit service reliability and provide a

framework for a program of demonstrations which could be carried out under the Service and Methods Demonstrations Program. Two cities are under consideration as candidates for a transit reliability demonstration grant — Minneapolis and Oakland.

Priority Treatments for High-Occupancy Vehicles

Many groups and individuals have voiced concern over the need to improve air quality and conserve energy while simultaneously reducing government expenditures. This concern has led federal, state, and metropolitan governments to develop plans to encourage the use of public transportation and carpools while maximizing the use of existing roadway systems. The Service and Methods Demonstrations Program has funded a variety of techniques to attract people to public transit. One of the most effective and obvious strategies has been to improve transit services by offering buses and carpools preferential treatment both on major highways and city streets.

To assist in the implementation of preferential treatment strategies, a planning manual for high-occupancy vehicle (HOV) priority facilities was published. The manual, developed for the Service and Methods Demonstrations Program by the Urban Consortium seems to have had a good reception and is being used by local planners and by many universities as an instructional aid.

On the whole, however, implementation of recommended

strategies has been slow, partly due to the constraint of funds. It is hoped that additional funding for innovations will spur these efforts in FY 79.

Two Service and Methods Demonstrations projects were either planned or implemented in FY 78. These projects are in San Francisco, Calif., and Houston, Tex.

San Francisco's downtown transit priority lane project (CA-06-0118) is designed to demonstrate the effectiveness of improved signing and pavement markings for reserved bus lanes in downtown business and shopping areas. The project also includes studies of the possibility of expanding the preferential street network in downtown areas and of the use of non-traditional personnel to enforce compliance with lane restrictions. The project, planned in FY 78, will begin operation in FY 79 and will continue through October 1980.

The Houston Corridor Improvement Project (TX-06-0018) is being implemented by the City of Houston as one of a number of coordinated improvements in the city's transportation system. The major activity in this project is the construction of ten miles of contraflow lanes for public transit vehicles on the North Freeway. The lanes are scheduled to open in the autumn of 1979. A park-and-ride lot capable of accommodating 750 automobiles and generating 26 to 30 bus trips during rush hour is planned for the facility.

In addition, transit priority treatments for two other Houston corridors, the Katy and Southwest Freeways, are currently under study. Other improvement projects include the acquisition of new equipment to refurbish and update the bus fleet, the

development of new transit facilities, a carpooling program, a downtown circulation system, and an express bus service.

Dulles International Airport— Improved Access Program

The purpose of this demonstration project (IT-29-2001) in the northern Virginia suburbs of Washington, D.C., is to determine whether improved high-speed bus service can encourage some air passengers to shift from the more accessible National Airport to the relatively less accessible Dulles International Airport. Rather than institute new transit service, most of the project's budget will go for improved information about the existing service. In addition, a mid-point airport bus stop will be developed at the conveniently located Rosslyn Metro Station.

A second purpose of this project is to test the effectiveness of such an improved bus service in encouraging passengers to change their habit of travelling by auto and taxi to one of travelling by the higher capacity bus.



The auto-restricted zone established in a busy shopping district of Boston, Mass., has relieved congestion in the area as these before-[top] and-after [bottom] photographs show.

Conventional Transit Service Innovations

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
TRANSIT MALLS						
Broadway Plaza Transit Mall	NY-06-0056	\$500,000	June 1976- Sept. 1982	Administration and Management Research Assoc. (AMRA), Inc.	TSC	Joseph Goodman (202) 426-4984
Transit Mall Study	DOT-TSC-0181	\$100,000	April 1976- Dec. 1978	TSC; Crain and Associates	N/A	Howard Simkowitz (617) 494-2552
AUTO RESTRICTED ZONES						
Boston Auto Restricted Zone	MA-06-0089	\$1,516,000	June 1978- Sept. 1980	Boston Redevelop- ment Authority, Mass.	TSC; Cam- bridge Systema- tics, Inc.	Joseph Goodman (202) 426-4984
Memphis Auto Restricted Zone	TN-06-0008	\$960,000	Sept. 1978- Sept. 1982	City of Memphis, Tenn.	TSC; Charles River Associates	Marvin Futrell, Jr. (202) 426-4984
Providence Auto Restricted Zone	RI-06-0010	\$960,000	June 1981- June 1982	City of Provi- dence, R.I.	TSC; Charles River Associates	Joseph Goodman (202) 426-4984
VEHICLE INNOVATION						
New York City Waterborne Mass Transportation	NY-06-0055	\$995,000	Sept. 1976- June 1979	Tri-State Planning Commis- sion, N.Y.	TSC	James Bautz (202) 426-4984
INNOVATIVE STUDIES						
Transit Reliability Study	MA-06-0049	\$75,000	May 1976- April 1978	TSC; Multi- systems, Inc.	N/A	Joseph Goodman (202) 426-4984

Conventional Transit Service Innovations

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
PRIORITY TREATMENTS						
Corridor Improve- ments in Houston, Texas	TX-06-0018	\$1,051,760	June 1975- Oct. 1980	City of Houston, Tex.	TSC; Cambridge Systematics, Inc.	Marvin Futrell, Jr. (202) 426-4984
Improved Transit Priority Lanes in San Francisco, California	CA-06-0118	\$213,498	Oct. 1978- Oct. 1980	Planning Dept., City of San Francisco, Calif.	TSC; Systan, Inc.	Marvin Futrell, Jr. (202) 426-4984
Dulles Inter- national Airport: Improved Access Program	IT-29-2001	\$175,500	Sept. 1979- Sept. 1980	Northern Virginia Transportation Commission	TSC; Multi- systems, Inc.	Joseph Goodman (202) 426-4984

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS may not have been published in sufficient quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become

available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

The Santa Monica Freeway Diamond Lanes Demonstration Project, Vol. 1, Summary
Proj. MA-06-0049
Systan, Inc.
September 1977, PB 286-567/AS

The Santa Monica Freeway Diamond Lanes Demonstration Project, Vol. II, Technical Report
Proj. MA-06-0049
Systan, Inc.
September 1977, PB 286-568

The Los Angeles Double Deck Bus Demonstration Project: An Evaluation
Proj. CA-06-0069
CACI, Inc.
March 1978, PB 287-837

New York City Double Deck Bus Demonstration Project: An Evaluation
Proj. NY-06-0044
CACI, Inc.
May 1978, PB 287-836

The Double Deck Bus Demonstration Project: Executive Summary
Proj. MA-06-0049
CACI, Inc.
May 1978, PB 287-838

A Comparative Analysis of Results from Three Recent Non-Separated Concurrent-Flow High Occupancy Freeway Lane Projects: Boston, Santa Monica and Miami

Proj. MA-06-0049

Transportation Systems Center

June 1978

Priority Treatment for High Occupancy Vehicles in the United States: A Review of Recent and Forthcoming Projects

Proj. MA-06-0049

Transportation Systems Center

August 1978, UMTA-MA-06-0049-78-37

Southeast Expressway High Occupancy Vehicle Lane Evaluation Report

Proj. MA-06-0049

Transportation Systems Center

May 1978, PB 285-209/AS

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Proj. VA-06-0042

Alan Voorhees and Associates,

Moore-Heder, Cambridge Systematics, Inc.

Vol. I, **Auto Restricted Zones: Background and Feasibility**, PB 286-313/AS

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Vol. III, **Auto Restricted Zones: Plans for Five Cities**, PB 286-315/AS

Vol. IV, **Site Selection Methodology**
PB 286-316/AS

Technical Appendix: Boston ARZ Study
PB 286-317/AS

Technical Appendix: Burlington ARZ Study
PB 286-318/AS

Technical Appendix: Memphis ARZ Study
PB 286-319/AS

Technical Appendix: Providence ARZ Study
PB 286-320/AS

Technical Appendix: Tucson ARZ Study
PB 286-321/AS

Miami, Florida I-95/NW 7th Avenue Bus/Car Pool Systems Demonstration Project

Proj. FL-06-0006

Metro. Dade County Transit Authority, Univ. of Fla.

September 1977

Phase I, Evaluation

Report I-2, **Effects of NW 7th Avenue Bus Priority Systems on Bus Travel Times and Schedule Variability**,
K.G. Courage, et al

Report I-3, **Changes in Transit Operational Characteristics on the NW 7th Avenue Express Bus System**,
R. Wolfe, et al.

Report I-4, **Modal Shift Achieved on the NW 7th Avenue Express Bus System**,
J.A. Wattleworth, et al.

Report I-5, **Effect of the Park 'n' Ride Facility on Usage of the NW 7th Avenue Express Bus System**,
J.A. Wattleworth, et al.

Report I-6, **Effects of NW 7th Avenue Bus Priority Systems on NW 7th Avenue Traffic Stream Flow and Passenger Movements**,
J.A. Wattleworth, et al.

Report I-7, **Evaluation of Characteristics of Users and Non-Users of the NW 7th Avenue Express Bus/Car Pool System**,
D. P. Reaves, et al.

Report I-8, **Effect of Bus Priority Systems Operation on Performance of Traffic Signal Control Equipment on NW 7th Avenue**,
K. G. Courage, et al.

Report I-9, **Economic Viability of the NW 7th Avenue Express Bus Operation**,
C.E. Wallace, et al.

Phase II, Evaluation

Report II-1, **Evaluation of the I-95 Express Bus and High Occupancy Vehicle Priority Systems**,

J. A. Wattleworth, et al.

Report II-2, **Evaluation of the Effects of the I-95 Exclusive Bus/Car Pool Lane Priority System on Vehicular and Passenger Movements**,

J. A. Wattleworth, et al.

Report II-3, **Evaluation of the Effects of the I-95 Exclusive Bus/Car Pool Priority System on the Express Bus System**,

J. A. Wattleworth, et al.

Report II-4, **Evaluation of Characteristics of Users and Non-Users of the I-95 Bus/Car Pool System**,

G. Long, et al.

Service and Methods Demonstration Program Annual Report

Proj. MA-06-0049

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April 1977, PB 270-673

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Streets for Pedestrians and Transit: Examples of Transit Malls in the United States.

Final Report - Phase I

Proj. MA-06-0049

Crain and Associates

August 1977, PB 278-487/AS

Urban Goods Movement Demonstration Project Design, Phases I and II: Executive Summary

Proj. IL-06-0030

A.T. Kearney, Inc.

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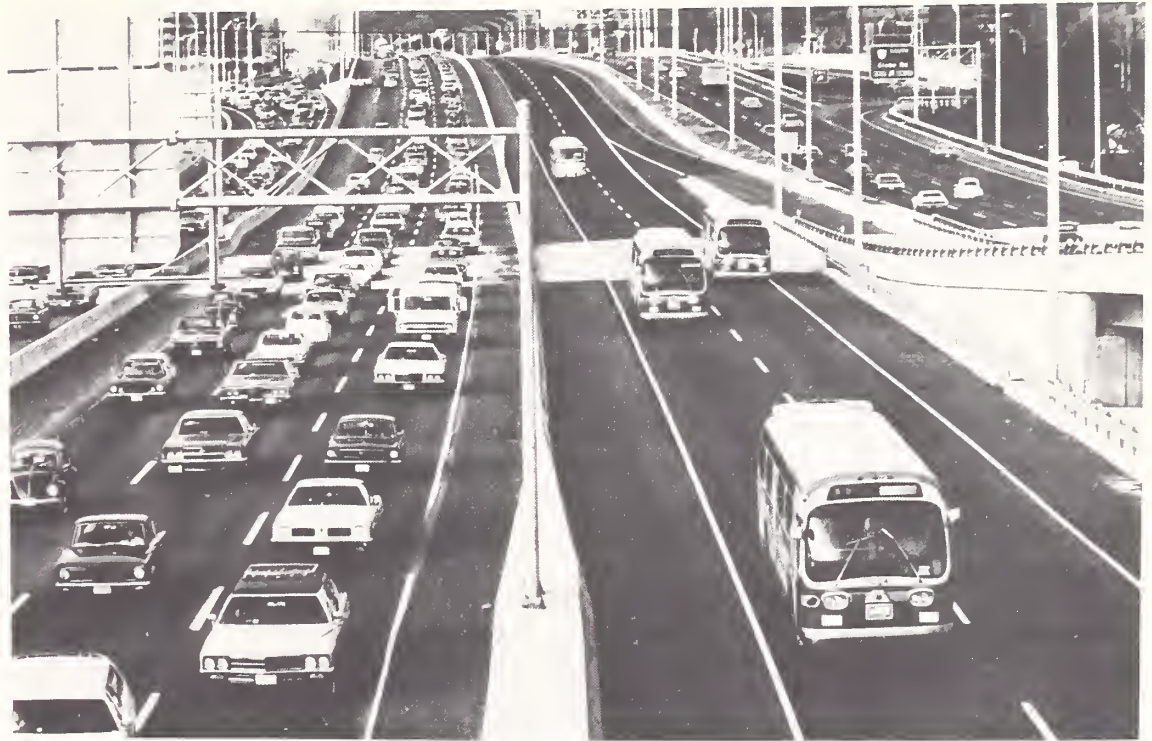
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**A Manual for Planning and Implementing
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Vehicles**

Proj. DOT-06-60076

The Urban Consortium for Technology
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At rush hour, two lanes are reserved exclusively for buses on the Shirley Highway leading into Washington, D.C.

Paratransit

Trends and Highlights

Paratransit as a service concept has apparently come of age and has begun to receive growing attention as an accepted part of the urban transportation network.

The recognition that one kind of transportation service cannot serve all markets and that services must be designed to meet the needs of particular market segments is one important reason for the growing interest in paratransit. A second major reason for developing paratransit services is to make better use of existing transportation resources in both the public and private sectors. UMTA's Service and Methods Demonstrations paratransit program is designing service models to show how these resources can be used in a coordinated fashion to serve markets more effectively than had been possible under a fixed-route system.

During FY 78 steady progress toward larger, more comprehensive projects has been made in the paratransit area. Attention has focussed on effective brokerage arrangements under which a mix of transportation services are coordinated to serve both the general public and special user groups, such as the transportation handicapped.

In spite of such progress, many problems remain. Labor agreements require time-consuming negotiations, and the agreements sometimes place restrictions on service. This is not a problem as far as the demonstrations are concerned, but could affect the flexibility of future paratransit operations. There have been difficulties, too, in attempting to integrate the private taxi industry with public transit.



Nonetheless, the paratransit demonstrations discussed in this section show that positive changes can be made in the approach to transportation problems. It is hoped that these demonstrations will continue to produce essential data and analytical results to assist others in planning similar operations.

Integration of Paratransit and Fixed-Route Systems

UMTA is testing a number of ways in which paratransit can supplement and complement regular transit service. Flexible paratransit services are also being implemented to help expand transportation services into areas that are too sparsely populated to support coverage by regular-route transportation systems. Other demonstrations are underway to integrate dial-a-ride bus service with fixed-route service and to test the use of shared-ride taxicabs as feeders to regular bus routes.

The Rochester (N.Y.) Integrated Transit Demonstration (RITD) (NY-06-0048) is an ongoing comprehensive project to demonstrate the integrated operation of fixed-route bus service with demand-responsive and other personalized bus services to provide improved transit service.

Significant innovations which have been tested in the demonstration include route rationalization (i.e., providing fixed-route or demand-responsive service where and when each is most effective and efficient), and transfer coordination between demand-responsive and fixed-

route services. Also, special prearranged subscription services are available for workers, school children, and elderly and handicapped residents. Along with this, computerized scheduling and dispatching and digital communications equipment are being tested to determine their impact on service levels and productivities.

PERT (Personalized Transit) service in the Rochester suburb of Greece pre-dated the RITD-project by more than a year and a half. In April 1976, PERT service was expanded to another suburb, Irondequoit, with a mixture of fixed and flexible-route bus services.

In September 1976, PERT service in Greece underwent a significant redesign. The many-to-many (m-m) dial-a-bus zone was reduced in size by substituting a route-deviation service into parts of the former m-m zone. A fixed-route shuttle service was instituted to connect high transit demand corridors with major retail facilities and fixed-route transfer points. A zonal fare structure in both Greece and Irondequoit was introduced to coincide with the redesign of the Greece service.

Some problems hampered the demonstration after the redesign took place. For instance, the project was continually plagued by vehicle failure and institutional problems. Dial-a-ride productivity, averaging around five passengers per vehicle hour, was below the anticipated level. In addition, route rationalization and transfer coordination were not particularly successful in attracting new ridership.

In hopes of attracting new ridership and increasing the productivity of the system, the fare structure was greatly simplified in January 1977. Services were further reduced in Greece and Irondequoit in

order to provide better service quality and more efficient operations in those areas where service continued to be provided.

In December 1977, a major expansion of the RITD project was approved by UMTA. The service in Greece and Irondequoit was continued under operation of the public transit provider. In addition, dial-a-ride service was expanded to the suburban communities of Brighton and Henrietta in July 1978. A private taxi operator was selected through competitive bid to provide these new services.

In addition, a special area-wide service for handicapped persons was added. By November 1978, all of the Rochester metropolitan area was covered by the dial-a-lift service for the handicapped. The dial-a-lift service in all areas except Greece and Irondequoit is provided by the private taxi operator.

The expanded project will facilitate further study of computerized scheduling and dispatching and will permit the comparison of costs between public and private operators.

The Westport (Conn.) Integrated Transit Services Demonstration Project (CT-06-0007-2), which began in April 1977, is designed to integrate fixed-route service provided by the district with new shared-ride taxi service provided by a private operator. The major features of the project include expanded fixed-route service, development of a shared-ride taxi service, implementation of a special advance-request, demand-responsive service for Westport's elderly and handicapped citizens, and package delivery service for Westport businesses.

The Westport Transit District, acting as the broker, is contracting with a local

taxi operator to provide the paratransit services.

During the course of developing shared-ride service, legal proceedings were initiated by another local taxi operator. The U.S. Circuit Court of Appeals in January 1978 reversed, in part, a previous decision of the District Court and held that Sections 3 (d) and 3 (e) of the Urban Mass Transportation Act which deal with public hearings, environmental impact, and protection of private operators apply to Section 6 grants. However, the Court also ruled that the taxi operator in question did not qualify as a "mass transportation company," and therefore was not entitled to Section 3 (e) protection. The United States Supreme Court refused to hear an appeal of the case in October 1978.

Westport's shared-ride taxi ridership has increased steadily to over five passengers per vehicle hour during FY 78. An important finding has been that the shared-ride taxi operation is providing a complementary rather than competing service to the fixed-route service. Future plans for the demonstration include ride-sharing promotion in the downtown area and other special arrangements with downtown merchants. The contract for operating the shared-ride taxi service, known as Maxytaxi, will be rebid in FY 79.

Taxicab Feeder to Bus Service (LA-06-0002) is a demonstration in St. Bernard Parish, La., a suburban area of 100,000 people near New Orleans. The project is testing the integration of taxicabs with conventional bus service. This project attempts to expand transportation service into a suburban area by using shared-ride taxi service. The taxis act as a feeder service to line-haul bus transit service.



Rainy weather doesn't seem to dampen the spirits of these vanpoolers in Golden Gate, Calif.

Features of the feeder service include coordination of transfers with bus schedules, joint fares, and sheltered bus stops.

No project results are yet available. However, the evaluation of the project will measure the level of service and the costs of the integrated services and compare them to other systems that could be implemented such as expanded fixed-route service or dial-a-ride bus services. The economic impact on the bus and taxi operations will be determined, including

whether the bus system is able to increase productivity or reduce costs because of the taxicab feeders, and whether regular taxicab revenue or operating costs are affected by the transfer service. The operational procedures that were developed for efficient coordination between the two systems will be documented as well.

Community-Based Transit System (OH-06-0022) is a small city transit demonstration in Xenia, Ohio, established

as an integral part of a community redevelopment program following a tornado disaster there in April 1974.

An UMTA Service and Methods grant awarded in July 1974, plus a capital grant, enabled the City of Xenia to establish a transit department, purchase vehicles, and operate a fixed-route service known as "X-line." Demonstration funds were then used to supplement fixed-route service with paratransit services. In the course of the demonstration the system evolved in stages to a form which consisted of a mix of differentially priced paratransit services including advance-request, shared-ride taxi, subscription and charter trips.

The demonstration ended in July 1978, and service has been suspended, pending permanent funding anticipated by January 1979. A final report evaluating the Xenia experience is expected in 1979.

A new project, Dade County (Fla.) Integrated Transit (FL-06-0018), funded in August 1978, is designed to develop detailed plans for a future demonstration of an integrated transit and paratransit system. Major features are expected to include a revision of taxi regulations in Dade County, integration of transit and taxi services, including taxi feeder to fixed-route service, and improved services for elderly and handicapped persons through coordination of social service transportation.

The purpose of another new project, Planning Study: Integrated Transit System with Economic Development Impacts (CT-06-0008), is to assist the Greater Bridgeport (Conn.) Transit District (GBTD) in planning an integrated system of transit and paratransit services. The Greater Bridgeport Transit District is in the process of buying out the area's four private bus

operators and establishing a new public transit system.

This project will explore the GBTD's role as broker for an integrated transportation system, assess the economic development generated through such a transit investment, and develop a plan of specific paratransit services to be provided, at least in part, through an operational demonstration funded under Section 6. In conjunction with this project, a technical studies grant for work related to economic development opportunities will be conducted in FY 79.

Another new project in FY 78 was Bicycle-Transit Integration (CA-06-0114). This project will demonstrate the integration of fixed-route bus service with special services for bicycle users in Santa Barbara, Calif. The project is designed to stimulate increased transit usage. Special facilities will include bicycle trailers designed to be pulled by buses on selected routes and bicycle lockers to be placed at various locations for bicycle access to bus routes.

Transportation Brokerage

A relatively new concept in transportation management is the use of a transportation broker to identify needs of various market segments and match them with the appropriate resources available.

Differences in urban areas require variations in transportation brokerage models. For example, in some cases the regional transit authority might assume the role of broker, while in other cases the city could perform the broker function.

Depending on existing circumstances, the broker's duties include contracting with private operators, modifying existing transit services, establishing carpool and vanpool programs, and/or coordinating social service agency travel. The broker acts in a coordinating role as far as providing service is concerned, and takes an active role in removing barriers to the more efficient use of existing vehicles.

Four projects were active in FY 78 which were specifically designed to demonstrate examples of transportation brokerage.

The Commuter Services Brokerage Demonstration (MN-06-0008) began in 1977 with the Minneapolis-St. Paul Metropolitan Transit Commission (MTC) acting as a broker to coordinate a variety of ride-sharing services at three separate multi-business work complexes in the South Hennepin area of Minneapolis. The project structures, coordinates and promotes carpooling, vanpooling, and subscription bus services, as well as existing public transit at these sites. The project is designed to develop and implement a comprehensive ride-sharing program which will reduce the number of single-occupancy automobile work trips.

One feature of the demonstration distinguishing it from other brokerage projects is that the vanpool service will be operated by a single vanpool provider under contract to MTC. The provider will operate all elements of the vanpool service including insurance, maintenance, and driver training. The vanpool provider will be offered public financial support to reduce the risks of the program and to cover start-up costs.

During FY 78, marketing was conducted in the three multi-business work centers which were thought to be representative of many urban worksites throughout the United States. Vanpooling has had minimal success; eight pools were formed, but only six are currently in operation. This is attributed to the site characteristics, i.e., diverse work schedules, many small service-oriented employers, and the need to use cars during the day on business, plus a relatively high fare structure. (The fare structure is currently under revision.) However, carpooling promotion has been relatively successful. Active telephone brokerage has facilitated matches. Along with these activities, many bus schedules have been distributed in response to inquiries, but there is no evidence of significant bus ridership increases. In FY 79 Commuter Service will market in five new areas (with Federal Aid to Urban Systems funds) and continue to provide services in the original three sites with UMTA funds.

The Transportation Brokerage Demonstration Project (TN-06-0006), in Knoxville, Tenn., has continued since 1975. A major objective of this demonstration is to determine the effectiveness of transportation brokerage in stimulating the development of paratransit services and in achieving more efficient use of available transportation resources in meeting community needs.

Initially, the City of Knoxville contracted with the University of Tennessee Transportation Center for the preliminary planning, operations and managerial activities of the project. The City of Knoxville is now acting as broker to

coordinate the travel demands of social service agency clients, and other commuters, with public and private transportation providers.

As part of the city's brokerage function, a vanpool program known as Knoxville Commuter Pool was implemented. The principal functions of the Knoxville Commuter Pool have included surveying employers to identify prospective ride-sharers, matching riders, promoting vanpooling by making available a fleet of 51 "seed vans" for lease to private individuals, and actively intervening to overcome institutional barriers to ride-sharing. A comprehensive program of incentives to encourage ride-sharing to and within the downtown area has also been initiated. In addition, assistance has been provided to social service agencies to help them lower transportation costs.

Carpooling and vanpooling were illegal in Tennessee until the broker lobbied successfully to have the law changed by the state legislature. In addition, project personnel worked with the Insurance Services Office, a rate advisory body of the insurance industry, to promulgate a new rate structure specifically for vanpools. This resulted in significantly lower rates. It is believed that the successful Knoxville experience has helped to increase the availability of vanpool insurance in other areas of the country.

A new project begun in FY 78 was the RTA Paratransit Brokerage (IL-06-0048) in the Chicago, Ill. metropolitan area. In this demonstration, the Regional Transportation Authority (RTA) is functioning as broker, coordinating a range of paratransit services for communities in

the suburban Chicago area. The transportation services, based on the needs of the individual communities, include shared-ride taxi, taxi feeder to fixed-route, subscription bus service, and special services for elderly and handicapped persons.

The paratransit services are funded and provided with technical and management assistance by the RTA. Both private and public operators provide the actual services.

The Pittsburgh Paratransit Broker Demonstration (PA-06-0042) is designed to coordinate paratransit services for elderly and handicapped persons in the Pittsburgh, Pa. metropolitan area through the use of a broker. The Port Authority of Allegheny County has selected a private firm to serve as the broker. The broker's Mass., to serve as the broker. The broker's primary functions will be to ensure the availability of all necessary dispatching and transportation resources, to provide a mechanism for the flow of funds, to actively market the system, and to monitor the entire system.

The project will give all social service agencies and individual elderly and handicapped consumers the opportunity to buy services on a unified paratransit system at ride-sharing rates. Allegheny County will be divided into service sectors for which providers will bid. Elderly and handicapped users who are not affiliated with an agency will be subsidized through a Port Authority user-subsidy program. The system is scheduled to go into actual operation in February 1979. (See Chapter 8 for a more detailed description of the project.)



A U. S. Navy woman catches the vanpool to work in Norfolk, Va.

Vanpool Demonstrations

Four vanpool demonstrations are currently being sponsored by the Service and Methods Demonstrations Program. These demonstrations are designed to reach a larger market than vanpool operations that are sponsored or organized by a single employer. Their purpose is to stimulate public agencies to take an active role in promoting area-wide vanpooling.

The Knoxville and Minneapolis vanpool projects, discussed previously, are part of broader brokerage operations involving other forms of ride-sharing and transit improvements. The Golden Gate (Calif.) and Norfolk (Va.) demonstrations are designed primarily for vanpool projects.

The Vanpool Demonstration Program, Golden Gate (CA-06-0095) was begun in 1977 by the Golden Gate Bridge, Highway and Transportation District along a major corridor leading to San Francisco. The demonstration is aimed at reducing congestion on the Golden Gate Bridge and U.S. Highway 101.

The district purchased 35 vans which are being leased to companies or groups of individuals. The district also conducts promotional campaigns to attract employers and individuals, and assists in matching riders and drivers into pool groups.

One feature of the Golden Gate project is the "seed" van concept. After a limited time period of approximately six months, the leased van is returned to the

district, and the group is expected to secure its own van to continue operation of the pool. The original van is then leased to another interested group also for a limited time period. The district will provide assistance to a pool group in arranging for the purchase or lease of its own van for long-term continuation of the pool.

The process of "seeding" has already begun with five vanpool groups moving to privately owned or leased vans or using vans of other van providers. However, the six-month "seeding" period appears to be a minimum, rather than a maximum, time period.

The other project, Vanpool Demonstration Program, Norfolk (VA-06-0033), provides a publicly operated, self-financed (after initial start-up costs) subscription van program which complements and is integrated into existing transit services. The service was started in September 1977 and is operated by the Tidewater Transportation District Commission of Norfolk in conjunction with the U.S. Navy.

The vanpool program leases vans to drivers who carry commuters to the area's naval facilities. All drivers and riders must be civilian or military employees of the Navy. There are five major naval bases in the Norfolk region which may participate in the program. Thus, while there is one overall employer, the Navy, multiple work sites are involved.

When this program was started, the only transit services to the naval facilities were provided by small private operators, generally using old school or intercity buses driven by employees of the naval facilities. Consequently, most travel to the bases was by auto. The subscription vanpool service is not intended to compete

with these private operators, but to complement the service they provide with the objective of shifting greater numbers of auto drivers to multiple-occupant vehicles. Support to the private operators is provided by the formation of an association which will assist private haulers by arranging loans for the purchase of new equipment and endeavor to provide them with reduced-cost equipment, parts, gasoline, and insurance.

Thirty vans are now in operation under the Norfolk vanpooling program, drawing participants from throughout the residential Tidewater region.

Other Paratransit Innovations

Other studies undertaken by the program are intended to provide planning and technical assistance, or to test other promising paratransit innovations.

One demonstration, the Employment Center Subscription Service (CA-06-0109), is testing the concept of providing short-haul subscription bus service to the El Segundo employment area of Los Angeles, Calif.

In the past, the use of subscription bus service has involved relatively long trip distances. This has been necessary in order to make economical use of the vehicle and still charge reasonable fares. However, the El Segundo employment area has shorter trip distances and staggered work hours which allow a vehicle to make multiple trips during the peak period. These conditions greatly increase vehicle and labor productivity, thereby reducing the cost to the user.

The El Segundo service began in June

1978, offering service along 14 routes on seven standard transit buses. The routes are designed to serve employees of two large firms employed on various shifts and at several work locations. Each bus in the project makes several prearranged pickup stops to serve walking or park-and-ride customers, and then travels express to the employment center. The bus then travels empty to a second pickup point and repeats the operation. Ridership is still small but continuing to build.

Another project, Analysis of Neighborhood Transportation: An Example of an Inner City Paratransit Service (PA-06-0041), was designed to learn more about unregulated neighborhood transportation services in areas which are not well served or not served at all by conventional transit and taxi operations. This analysis of neighborhood transportation was undertaken in order to determine the impact of unregulated transportation services on a locality's regulated transportation systems. Pittsburgh, Pa. was the specific site selected for this study.

The three primary objectives of the project were: 1) an analysis of transportation supply and demand; 2) an analysis of alternate fare pricing and the range of services; and 3) recommendations for future research. Four types of paratransit services were analyzed: bus and airport terminal service; neighborhood telephone and dispatching service; flexible and fixed-route neighborhood service; and neighborhood supermarket service.

A draft report is now being reviewed and a final report should be available in FY 79.

A new project, Shared-Ride Taxi Fare Calculation (PA-06-0048), is designed to

provide technical assistance to several communities in implementing a computerized fare calculation system for shared-ride taxi. Conventional fare systems, including meters and zone fares, generally do not work in shared-ride systems. A computerized shared-ride taxi fare calculation system has been developed by Carnegie-Mellon University and will be adopted for use in selected cities.

Another new project in FY 78, the Orange County (Calif.) Computerized Demand-Responsive Transit (CA-06-0095), is planning the implementation of an automated dispatching and vehicle control system for the county's dial-a-ride services. Orange County operates a dial-a-ride service in five communities, and also a county-wide dial-a-ride program in addition to the county-wide fixed-route bus systems. This project is based on the software developed in connection with the Rochester demonstration and will permit a further refinement of the system.

The Paratransit Planning Project (VA-06-0050) is known as the Easyride ride-sharing program. This project will define and evaluate various paratransit packages for use in the Newport News-Hampton Peninsula area of Virginia. The Easyride program will develop procedures by which services can be financed and delivered with a focus on five major peninsula employers, selected social service agencies, and the transportation disadvantaged. The major objectives of the project are to: 1) reduce auto use for the work trip; 2) investigate paratransit as a substitute for, or feeder to, fixed-route bus service; and 3) to design alternative paratransit methods and financing avenues for services to the transit dependent.

Paratransit

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
INTEGRATED PARATRANSIT, FIXED-ROUTE SYSTEMS						
Integrated Demand-Responsive — Fixed-Route Transit Systems	NY-06-0048	\$4,298,200	Feb. 1975- July 1979	Rochester-Genesee Regional Transportation Authority, N.Y.	TSC; MIT; Systan, Inc.	Paul Fish (202) 426-4984
Integrated Taxi/Fixed Route Transit Systems	CT-06-0007-2	\$819,518	July 1976- June 1979	Westport Transit District, Conn.	TSC; CACI, Inc.	Mary Martha Churchman (202) 426-4984
Taxicab Feeder to Bus Service	LA-06-0002	\$325,350	May 1976- April 1979	St. Bernard Parish Planning Commission, La.	The Urban Institute	Paul Fish (202) 426-4984
Community Based Transit System	OH-06-0022	\$793,666	July 1974- July 1978	City of Xenia, Ohio	TSC; Multisystems, Inc.; Cambridge Systematics, Inc.	Larry Bruno (202) 426-4984
Dade County Integrated Transit	FL-06-0018	\$167,162	Aug. 1978- June 1979	Dade County Office of Transportation Administration, Fla.	TSC	Paul Fish (202) 426-4984
Planning Study: Integrated Transit System with Economic Development Impacts	CT-06-0008	\$135,000	Aug. 1978- Aug. 1979	Greater Bridgeport Transit District, Conn.	TSC	Mary Martha Churchman (202) 426-4984
Bicycle-Transit Integration	CA-06-0114	\$182,000	March 1978- March 1980	Santa Barbara Metropolitan Transit District, Calif.	TSC	Paul Fish (202) 426-4984
TRANSPORTATION BROKERAGE						
Commuter Services Brokerage Demonstration	MN-06-0008	\$335,000 (UMTA) \$560,000 (FAUS)	April 1977- April 1979	Metropolitan Transit Commission, Minn.	TSC; Cambridge Systematics, Inc.	Mary Martha Churchman (202) 426-4984

Paratransit

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
TRANSPORTATION BROKERAGE						
Dissemination of Transportation Brokerage Concept	TN-06-0010	\$239,834	Oct. 1978- Jan. 1980	University of Tennessee		Mary Martha Churchman (202) 426-4984
Transportation Brokerage Demon- stration Project	TN-06-0006	\$998,000	June 1975- Dec. 1978	City of Knoxville, Tenn.	N/A	James Bautz (202) 426-4984
RTA Paratransit Brokerage	IL-06-0048	\$550,188	March 1978- March 1980	Chicago Regional Transportation Authority, Ill.	TSC; DeLeuw Cather and Co.	Mary Martha Churchman (202) 426-4984
Pittsburgh Paratransit Broker Demonstration	PA-06-0042	\$1,250,000	July 1978- July 1980	Port Authority of Allegheny County, Pa.	Charles River Associates	Lynn Sahaj (202) 426-4984
VANPOOL DEMONSTRATIONS						
Vanpool Demon- stration Program, Golden Gate	CA-06-0095	\$738,000	Aug. 1977- June 1979	Golden Gate Bridge, Highway and Trans- portation District, Calif.	TSC; Crain and Associates	Paul Fish (202) 426-4984
Vanpool Demon- stration Program, Norfolk	VA-06-0033	\$490,000	Sept. 1976- Sept. 1979	Tidewater Trans- portation Commis- sion, Va.	TSC; CACI, Inc.	Lynn Sahaj (202) 426-4984
OTHER PARATRANSIT INNOVATIONS						
Employment Center Subscription Service	CA-06-0109	\$538,100	Nov. 1977- Dec. 1979	Southern California Rapid Transit District	TSC; Systan, Inc.	Paul Fish (202) 426-4984
Analysis of Neigh- borhood Transportation: An Example of an Inner City Paratransit Service	PA-06-0041	\$59,750	Jan. 1977- Dec. 1978	Carnegie-Mellon University	N/A	Larry Bruno (202) 426-4984

Paratransit

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	EVALUATION	TECHNICAL CONTACT
OTHER PARATRANSIT INNOVATIONS						
Shared-Ride Taxi (SRT) Fare Cal- culation	PA-06-0048	\$69,983	Sept. 1978- Sept. 1979	Carnegie-Mellon University	N/A	Paul Fish (202) 426-4984
Orange County Computerized Demand-Responsive Transit	CA-06-0095	\$134,000	May 1978- Feb. 1979	Orange County Transit District, Calif.	TSC	Paul Fish (202) 426-4984
Paratransit Planning Project	VA-06-0050	\$250,000	July 1978- July 1980	Peninsula Trans- portation District Commission, Va	N/A	Lynn Sahaj (202) 426-4984

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS may not have been published in sufficient quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

Feasibility Study of the Employment Center Bus Service Concept

Proj. CA-06-0084
The Aerospace Corporation
August 1976, PB 259-941/AS

An Analysis of Commuter Van Experience

Proj. DC-06-0120
The Urban Institute
February 1976, PB 252-304/AS

Guidelines for the Organization of Commuter Van Program

Proj. DC-06-0120
The Urban Institute
February 1976, PB 252-304/AS

Evolution of the Knoxville Transportation Brokerage System: Interim Report

Proj. TN-06-0006
CACI, Inc.
October 1976, PB 270-103

A Compendium of Provisions for a Model Ordinance for the Regulation of Public Paratransit

Proj. IL-06-0029
International Taxicab Association
February 1976, PB 253-182/AS

Small City Transit

Proj. MA 06 0049

Transportation Systems Center

March 1976

Characteristics: An Overview, PB 251 501/AS

Free-Fare, Student-Operated Transit in a University Community: Amherst, Massachusetts, PB 251 502/AS

Pilot Dial-A-Ride Project in a Sector of the City: Ann Arbor, Michigan, PB 251 503/AS

Privately Operated Subscription Bus Service to an Industrial Site: Bremerton, Washington, PB 251 504/AS

Public Transit Serving a University and Town: Chapel Hill, North Carolina, PB 251 505/AS

Free-Fare Transit in a High Density, Industrialized Area: East Chicago, Indiana, PB 251 506/AS

City-Wide Shared Ride Taxi Service: El Cajon, California, PB 251 507/AS

Extensive County-Wide Transit Coverage: Eugene/Springfield, Oregon, PB 251 508/AS

A Low Subsidy Transit Service: Evansville, Indiana, PB 251 509/AS

Dial-A-Ride Transit in an Agricultural Community: Merced, California, PB 251 510/AS

Point Deviation Service in a Rural Community: Merrill, Wisconsin, PB 251 511/AS

A Short-Lined Suburban Transit Service: Sudbury, Massachusetts, PB 251 512/AS

Comprehensive Transit in an Affluent Suburban Community: Westport, Connecticut, PB 251 513/AS

A Transit Service for a Rebuilding City: Xenia, Ohio, PB 251 514/AS

Summary of State Aid Programs, PB 251 515/AS

Service and Methods Demonstration Program Annual Reports

Proj. MA 06 0049

Transportation Systems Center

November 1975, PB 251 325/AS

April 1977, PB 270 673

Evolution and Operations of the Reston, Virginia Commuter Bus Service: Final Report

Proj. MA 06 0049

CACI, Inc.

August 1977, PB 275 792/AS

Pre-Demonstration Activities of the Westport Integrated Transit System: Interim Report

Proj. MA 06 0049

CACI, Inc.

July 1977, PB 271 998/AS

Com-Bus: A Southern California Subscription Bus Service, Final Report

Proj. MA 06 0049

CACI, Inc.

May 1977, PB 272 475/AS

Feasibility Study of Shared Ride Auto Transit

Proj. MN 06 0008

O. Foul, D. Zieker, and J. Neuman

September 1977, PB 276 539/AS

Rochester, N.Y., Integrated Transit Final Evaluation Report

Proj. NY 06 0048

Long, Evans, and Michael Hurd, Inc.

September 1978

The Knoxville Transportation Brokerage Project, Volume II: Operations and Management

Proj. TN 06 0006

The University of Tennessee

Transportation Center

October 1977, PB 282 248/AS

Evaluation Plan: The Minneapolis Ride-Sharing Commuter Services Demonstration

Proj. MN 06 0008

Ed. Sherman

May 1978

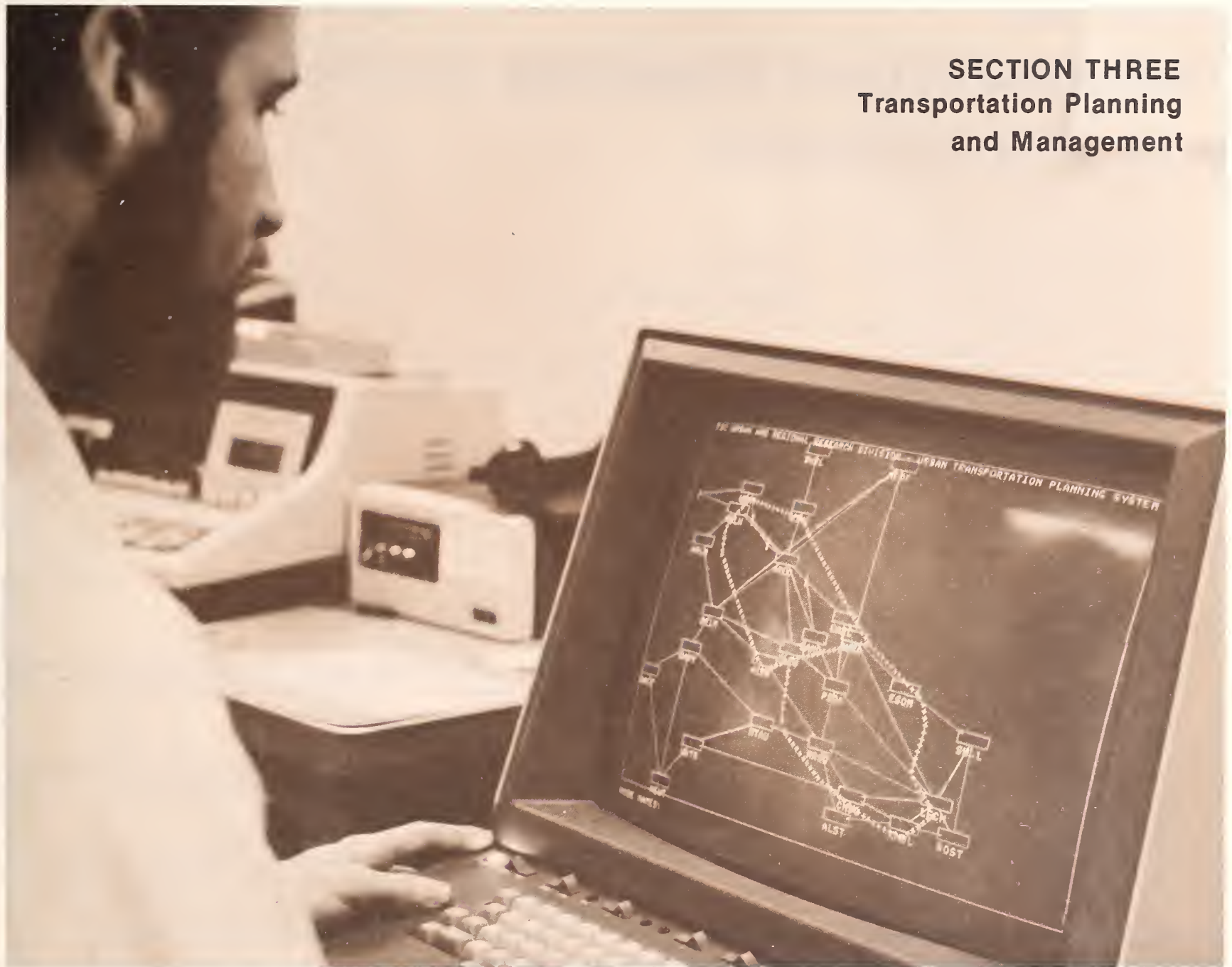
Interim Evaluation Report: The Minneapolis Ride-Sharing Commuter Services Demonstration

Proj. MN 06 0008

Ed. Sherman

November 1978

SECTION THREE Transportation Planning and Management



Transportation Planning and Management

The objective of UMTA's planning and management programs is to achieve more effective and economical results from federal planning and spending by developing better information systems and improved planning and management techniques.

Through its Office of Planning Assistance, UMTA supports special planning studies described in Chapter 12 which are designed to improve the quality of information available for use in the local planning process and in UMTA policy making and investment decisions. The objective of these studies is to improve evaluation techniques and develop information which can be readily and accurately transferred from one area to another.

During FY 78, studies to investigate the impact of major transit investments have continued to have a high priority. Special studies have been undertaken to determine the effects of major rail rapid transit improvements in San Francisco, Washington, D.C., and Atlanta. Studies have also been undertaken to examine the efficiency of various UMTA policies, such as elderly and handicapped regulations, and to develop Transportation System Management (TSM) prototype planning studies, as well as new planning tools for

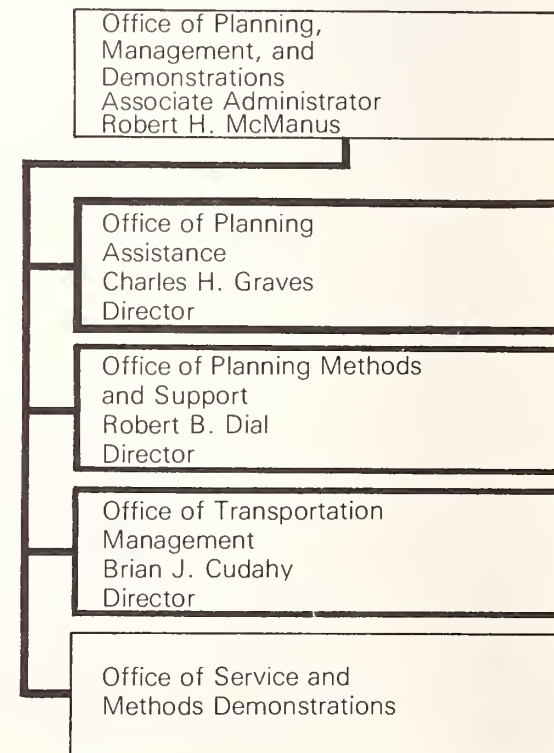
TSM in response to UMTA's policy on efficient use of existing transportation facilities. Funds allocated for special studies were also expended during FY 78 on projects designed to improve short-range transit planning tools and demonstrate the capabilities of local agencies in conducting energy contingency planning studies.

Under the Planning Methods and Support Program discussed in Chapter 13, improved computer and manual techniques are being developed to assist federal, state and local agencies in planning, programming and budgeting improvements to their transportation systems. This package of techniques, known collectively as the Urban Transportation Planning System (UTPS), supports both national and local transportation agencies and is useful in evaluating alternative system improvements. The goal of the UTPS system is to provide essential support for UMTA's planning assistance and capital support programs by continually improving local and federal planning capabilities.

Work in the Transit Management Program is described in Chapter 14. This program is designed to assist mass transit operators in making the most effective use of their limited funds. The program undertakes research and demonstration

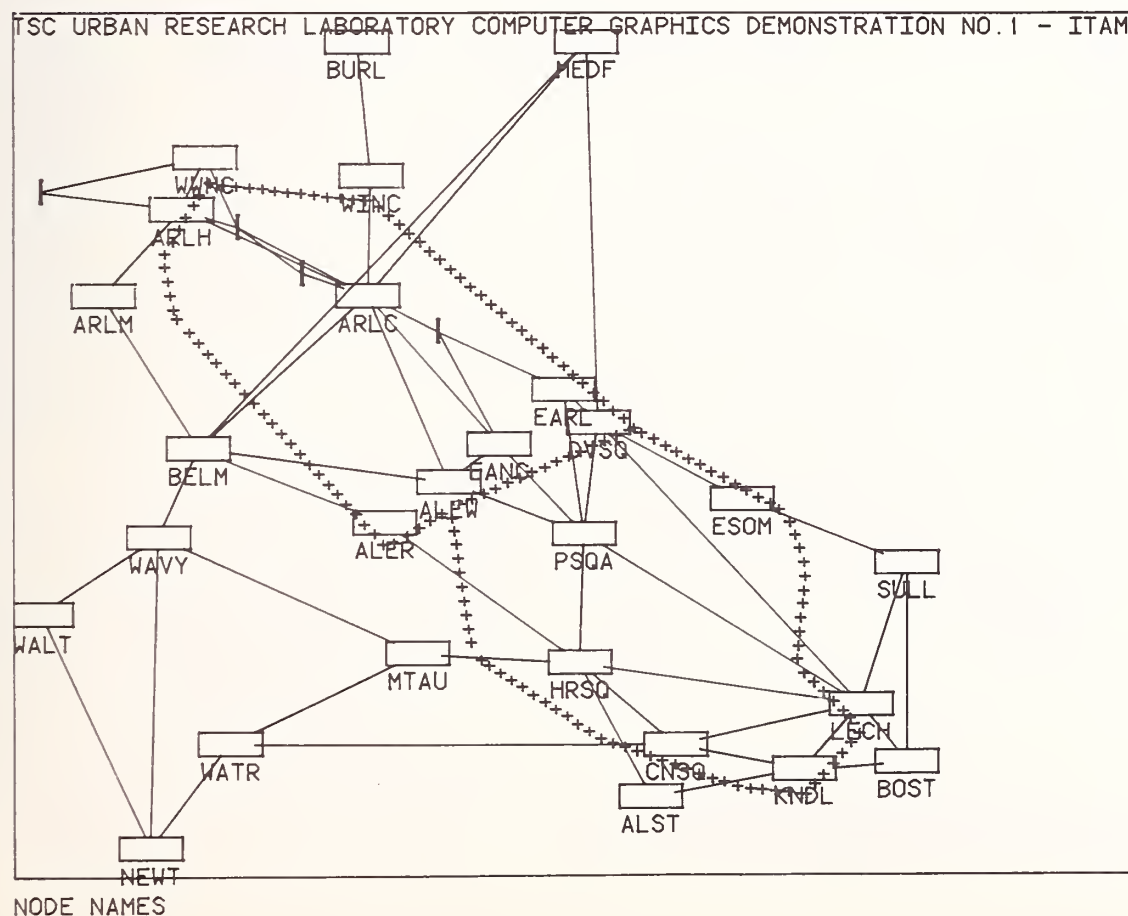
projects to develop improved management techniques for the transit industry, as well as efforts to implement these techniques in the daily operations of transit systems. The Transit Management Program is also responsible for administering the uniform reporting system required under Section 15 of the Urban Mass Transportation Act. The regulation requires the development of uniform operating and financial reporting, as well as uniform accounts and record-keeping systems.

The organization of the Office of Planning, Management and Demonstrations is shown below. The projects described in this section are funded and administered through the program offices indicated in bold outline on the chart.



Planning Methods and Support

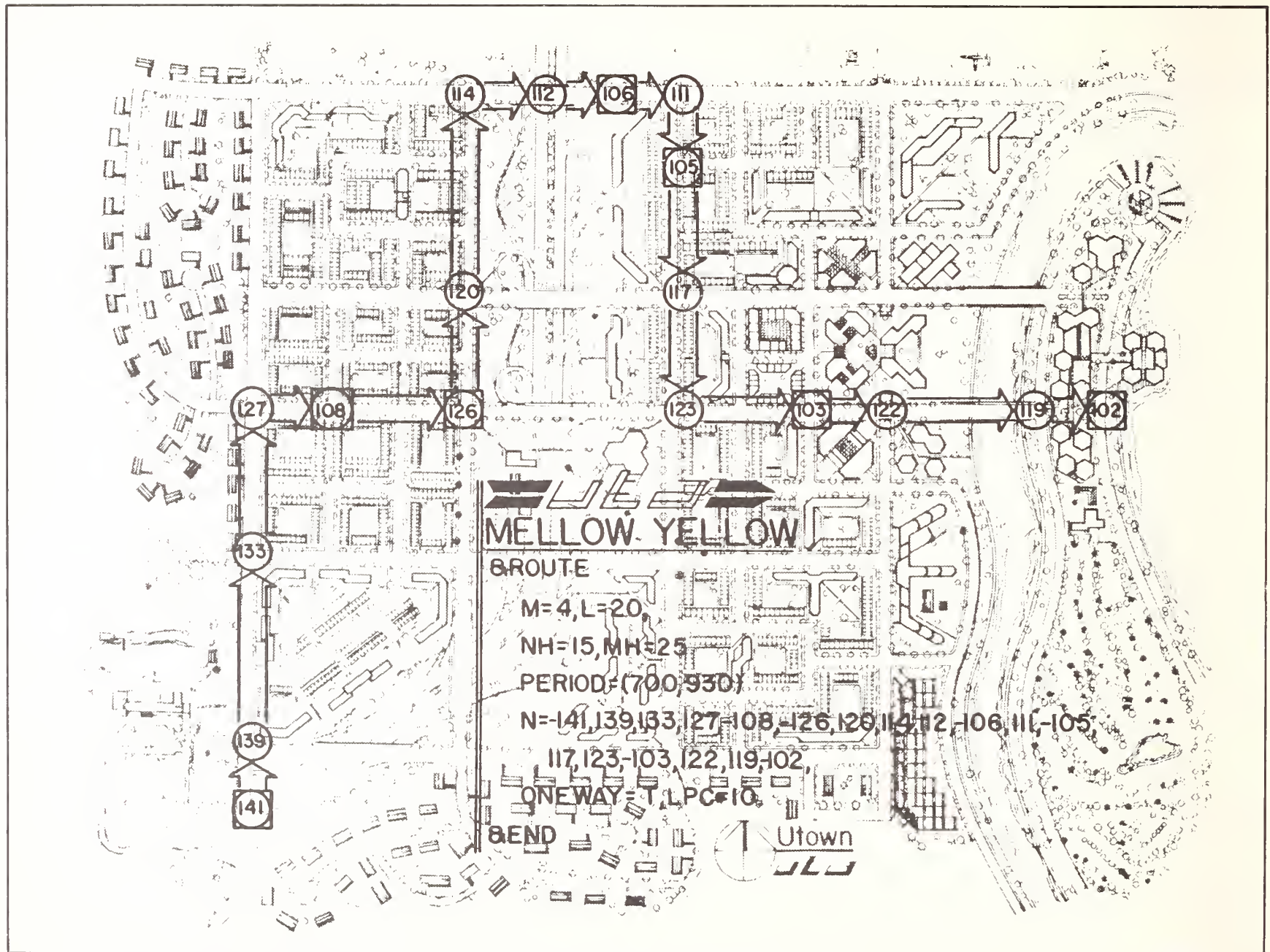
Trends and Highlights



The Planning Methods and Support (PMS) program provides essential support for UMTA's planning assistance and capital grant programs. The continuing goal of PMS is to research, develop, demonstrate and disseminate computerized and manual techniques to assist federal, state and local agencies in their planning, programming, budgeting, and implementation of improvements in their transportation systems.

Inseparable from these activities has been the maturation of the Urban Transportation Planning System (UTPS). UTPS is an expanding, carefully coordinated collection of computer software, technical manuals and other analytical aids developed and distributed by UMTA and the Federal Highway Administration (FHWA). The content of UTPS is continually evolving. Old tools are improved and new tools are added as new policy and technical requirements surface or R&D breakthroughs occur.

Conducted jointly with the FHWA, the program responds to what is consistently reported as the highest priority near-term need of state and local agencies, i.e., for people and tools which can come to grips with the highly complex variables and constraints involved in transportation planning. The information and information handling requirements for estimating demand, evaluating alternatives, and assessing energy, environmental and economic impacts make UTPS essential.



After seeing the UTPS solve hypothetical problems, such as the bus routing one from a training manual shown above, planners can use the system to deal with real-life transportation problems.

Mission of the Urban Transportation Planning System

UTPS hand calculator techniques can be used for quick-response approximations and for less complex planning problems. The procedures usually solve only specialized problems and consist of evaluations, graphs and curves to forecast or estimate impacts.

The UTPS computer-based package is provided for examining transportation options requiring greater planning detail and comprehensiveness. Various combinations of highway and transit can be evaluated. The package consists of a number of modules which provide the analytical framework to incorporate locally described transportation networks and land use and socio-economic data. The process can address either short or long-range planning horizons. The initial time and cost required to use the computer are greater than for a hand analysis, but the resulting information is much more detailed and comprehensive.

Capabilities of the computer package include estimation of land development impacts, transportation system costs, travel demand forecasts, major facility and corridor travel volumes, energy use, major air quality effects and accidents. The package can be employed to answer questions at a microscopic, detailed, street-by-street level for short-range problems. For more macroscopic decisions, sketch planning methods are available at a reduced level of effort and lower cost.

The computer package consists of a number of related and permutable programs. Each program represents a separate step in the local transportation planning process which might include network preparation, travel demand estimation and assignment of travel to the network. At each step, modifications can be made to model the transportation option that is to be tested: for example, roads or transit lines might be added to or deleted from the network in the first step, land use changed to generate more trips in the second, and highway capacities changed in the third. There are also several programs which can be used to prepare plots, tables or graphs to compare results from different alternatives.

Current Program Plans

The PMS effort intends to accomplish its mission by continually improving the UTPS package of planning tools. R&D results from many sources are integrated into UTPS and passed on to the planning community. This more conservative approach ensures an ever-improving state-of-the-art, and guarantees concrete benefits, at the lowest possible financial risk, from the PMS program.

Besides the software maintenance and pilot-testing chores, specific technical objectives for FY 78 and the next two fiscal years can be grouped into the following categories.

1. System Evaluation
2. Transportation System Management
3. Data Capture and Disclosure
4. Computer Science and Operations Research

5. Technology Transfer

Each is discussed separately below. The PMS program will draw on existing software, models, and the state-of-the-art in general to cut costs while maintaining quality.

System Evaluation

System evaluation is the essence of planning. The PMS program will produce tools to greatly improve the planner's ability to generate, evaluate, and select transportation alternatives of both the capital and non-capital intensive varieties. In addition, R&D projects related to comparing alternatives among cities are being considered. The following products will be produced:

1. Planning case studies,
2. Improved cost and patronage forecasting models,
3. Land use forecasting and evaluation models,
4. Project selection models, and
5. Reference manuals.

Transportation System Management (TSM)

The most important characteristic of the PMS program will be its emphasis on developing tools to examine short-term improvements and to assist operational planning. This emphasis shows itself in the transportation system evaluation tools and the data capture and disclosure tools, as well as in TSM.

Major TSM concerns include multimodal cost analyses and trade-offs which must be made over a range of transit operations and traffic engineering options. TSM includes projects which directly assist in the optimal exploitation of existing transportation resources, such as network

data management system, computer-aided routing and scheduling tools, and network micro-simulation models.

Data Capture and Disclosure

The planner and operator need information to monitor the transportation system's performance. To reduce the cost and increase the accessibility of performance data, survey technology and census data are used.

Computer Science and Operations Research

Projects in computer science and operations research include a proposed project to develop an operational planning system (OPS) for use on a mini-computer. Others are improved software engineering, interactive computer graphics, and a mathematical programming package.

Technology Transfer

Three projects are planned to facilitate the transfer to PMS program products to transportation planners and operators. These projects, while requiring relatively little funding, are significant in that they increase the acceptance and use of PMS products and, therefore, of the program itself. These projects include Urban Consortium interface, development of teaching aids and user materials, and a continual PMS program assessment.

Recent Program Products

During FY 78 the PMS program yielded a number of planning aids that are now in local use. They include manual methods, software and training materials.

Documents

A documentation series has been initiated to include manual tools as well as users' guides supporting UTPS computer methods. Topics include aids for small urban area transit planning, a series on specialized problems such as parking accumulation and fringe parking requirements, methods for treating demand-responsive systems, and a package of materials on transit station planning and design. The latter includes a slide-tape presentation and a film on the application of the USS (Station Simulation) model.

Two manuals containing invaluable data on the characteristics of urban transportation supply (CUTS II) and demand (CUTD) were published. Case studies illustrating planning for advanced technologies were documented and distributed to planners. (Although dual mode transit was the focus, the resulting methodologies are very general and include combined computerized/manual sketch planning approaches.) A planning guide was produced for a Milwaukee study.

Software

During FY 78 the UTPS computerized package received major enhancements. The computer programs are very flexible, user-oriented, and adhere to uniform, high quality standards. UMTA and FHWA share a commitment to distribute, maintain and upgrade these programs on a continuing basis.

As initially constituted, the UTPS computer programs primarily supported long-range system planning, wherein the alternatives to be analyzed were few in number, but in sufficient detail to estimate

land development impacts, system costs, major facility and corridor volumes, levels of service and some impacts such as energy use, major air quality effects, accidents and others. Recently the improved UTPS package has also been used with moderately satisfactory results for shorter term transit operations studies and, with some simplifying approximations, for the screening of numerous long-range alternatives. More appropriate programs for these latter activities are now under development by UMTA and FHWA, and will become components of UTPS during the next year. The local process may then take advantage of the new UTPS capabilities to develop, evaluate and assist in operational planning of the present transportation system. The modeling process can also predict a range of transportation system improvements to any desired future year or implementation horizon.

Current Contents of UTPS Software

Each UTPS program relates to one or more of the following analytical categories:

1. Network Analysis,
2. Demand Estimation,
3. Matrix Operations and Evaluation, and
4. Sketch Planning.

Network analysis pertains to network coding for computer input, system costing and other network evaluation procedures. Trip generation, distribution and mode split, including both model calibration and forecasting, are subsumed under demand forecasting. Passenger loading relates a matrix of interzonal travel demand (trip



Training in the UTPS, like the session shown here in Nashville, Tenn., has been provided to over 1500 transportation planners throughout the country.

table) to the appropriate components of the proposed system. Additionally, for purposes of network evaluation, the process requires a good many matrix operations, entailing calculation, restructuring, modification and disclosure of the contents of the many matrix data sets required in transportation planning. For example, zone-to-zone trip tables, travel time matrices, fare matrices, etc. are

involved. Sketch planning uses coarser techniques to speed up the same process with some sacrifice in accuracy.

During FY 78, major new capabilities were added in the transit network pathfinding process. Also, a highway network aggregation capability now permits detailed network analysis of a regional sub-area at reduced computer costs. Plotting capability was incorporated

in all network programs. Disaggregate demand model calibration is possible with a logit calibration program and a very powerful regression package. An enhanced gravity model program has been added. Major new data manipulation capabilities and matrix operations are possible. A UTPS/census data interface now exists. CAPM, a sketch planning model, is now available for aggregate regional highway planning.

UTPS runs on an IBM 360/370 (OS) compatible computer system only. The programs and all documentation are provided on a 2400-foot magnetic computer tape supplied by the requestor.

A one-time copying fee of \$40.00 will be charged to profit-making organizations (subsequent versions are copied free of charge). A check or money order should be made payable to the Urban Mass Transportation Administration. There is no charge to non-profit organizations. The tape will be returned as SL, 9-track in the density specified on the order form. Allow one week, plus postal delivery time, for processing. Recipients of UTPS will automatically be kept informed regarding UTPS status and developments.

Further information about the UTPS package is available from:

Dr. Robert B. Dial, UPM-20,
Director
Office of Planning Methods and
Support
Urban Mass Transportation
Administration
U.S. Department of
Transportation
Washington, D.C. 20590

In addition to the UTPS package, other special purpose software and docu-

mentation have been released. Two interactive graphics programs have been packaged for short-range transit planning. They operate only on PDP10 computers with a TEKTRONIX graphics terminal. Also, a discrete-event micro simulation model (USS) permits evaluation of pedestrian flows with respect to the layout of a transit or multi-modal station. USS operates on IBM 360/370 equipment.

To complement the dissemination of computerized and manual methods, improved training materials and courses have been developed. Slide-tape presentations and a self-instructional text on the planning process are available. FHWA and UMTA jointly teach four introductory one-week courses per year on transportation planning, which were redesigned in FY 78. A one-day management introduction and a five-day UTPS technical session are offered four times per year. These sessions are updated to reflect the most current state-of-the-art. Symposia are scheduled periodically to inform current UTPS users of new research products and to provide an opportunity for mutual information exchange.

Upcoming UTPS Improvements

There will be several additional products available in the near future resulting from research conducted in FY 78.

A number of planning manuals will be distributed. Included will be one on the Downtown People Mover (DPM), useful in analyzing short tripmaking in high activity centers for a broad range of transportation

technologies. Other items include a manual technique for evaluating transit corridors and a guide for utilizing the Bureau of Census data files with new UTPS computer programs. Several mini-case studies will illustrate specialized applications of UTPS. A package of desk calculator methods for performing specialized TSM analysis will be available.

UTPS software development will be completed for several programs which support transit operations analysis. INET, a program which permits coding transit networks from available highway and street networks will be distributed. Through the program it will be possible to affect street congestion and various transit operations. What was formerly a complex network coding process, now becomes an extremely efficient process given the highway networks which are usually well maintained by local areas. Additional improvements will be made in transit costing and fare analysis methods, and the software will be interfaced with the currently available RUCUS (run-cutting and scheduling techniques).

Also, UTPS will be made compatible with most relevant census data files and computer programs. Special analytical capabilities will be added. Highway network programs will permit analysis of street intersections and special traffic flow control concepts. A greatly enhanced statistical analysis program will also be distributed. Both interactive graphics programs will be converted to operate on IBM 360/370 systems.

During FY 79, the PMS program will initiate a major research effort to make the UTPS computer programs transferable to a large number of computer systems.

Planning Methods and Support

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
Transportation Corridor Sketch Planning Model	NY-06-0068	\$57,899	Oct. 1978- Oct. 1979	State University of New York at Buffalo	Robert Dial (202)426-9271
Programmable Desk Calculator TSM Plan- ning Methodology	MA-06-0092	\$98,445	July 1978- Aug. 1979	Massachusetts Institute of Technology	Tom Hillegass (202) 426-9271
A Model Relating Transportation to Neighborhood Change	MA-06-0090	\$141,777	May 1978- Nov. 1979	Massachusetts Institute of Technology	Tom Hillegass (202) 426-9271
MACRO — Manual Revision	MD-06-0046	\$9,892	March 1978- March 1979	COMSIS, Inc.	Tom Hillegass (202) 426-9271
Enhanced Transit Cost Model (UCOST)	MD-06-0041	\$99,400	July 1978- July 1980	University of Maryland	Larry Quillian (202) 426-9271
Short-Range Transit Planning	IT-06-9020	\$5,000	Multi-year continuing	Peat, Marwick, Mitchell and Co.	Tom Hillegass (202) 426-9271
Developmental Support DPM Guideway Flow Simulation Model DPM Planning Manual Station Simulation Interactive Software General Software Development R&D Feasibility Studies	MA-06-0039	\$780,000	Multi-year continuing	TSC	Gran Paules (202) 426-9271
Interactive Graphic Transit Design Sys- tem Demonstration	WA-06-0068	\$10,000	Oct. 1978- Oct. 1979	Puget Sound Council of Governments, Wash.	Gran Paules (202) 426-9271

Planning Methods and Support

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
UTPS Software Development Statistical Method	MD-06-0014	\$220,000	Multi-year continuing	National Bureau of Standards	Robert Dial (202) 426-9271
UTPS Maintenance and Enhancement	DC-06-0227	\$45,000	Multi-year continuing	FHWA	Ed DeLong (202) 426-9271
Use of Census Data and Design of Machine Independent Software Language for UTPS	DC-06-0178	\$523,796	Multi-year continuing	National Institute for Community Development	Tom Hillegass (202) 426-9271
UTPS User Aids	DC-06-0240	\$75,000	Sept. 1979-Dec. 1981	FHWA	Lenny Goldstein (202) 426-0182
UTPS Technical Support and Dissemination	MD-06-0023	\$47,000	Multi-year continuing	Price, Williams and Associates	Gran Paules (202) 426-9271
Collection of Dis-aggregate Data Set	IT-06-0076	No FY 78 Funds	Multi-year continuing	FHWA	Larry Quillian (202) 426-9271
Interactive Planning System Design Support	IT-06-0050	No FY 78 Funds	Multi-year continuing	Peat, Marwick, Mitchell and Co.	Robert Dial (202) 426-9271
USS Transit Station Simulation Model	NJ-06-0010	No FY 78 Funds	Sept. 1976-March 1978	Princeton University	Gran Paules (202) 426-9271
Downtown People Mover (DPM) Planning Manual	NY-06-0063	No FY 78 Funds	Aug. 1977-June 1979	Regional Plan Association, Inc.	Gran Paules (202) 426-9271
Application of New Urban Travel Forecasting Procedures	DC-06-0198	No FY 78 Funds	Multi-year continuing	FHWA	Tom Hillegass (202) 426-9271

Planning Methods and Support

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
Dissemination Support Through Urban Consortium	DC-06-0187	\$164,000	Multi-year continuing	OST; Urban Consortium	Gran Paules (202) 426-9271
Dual Mode Transit Planning Case Study: Orange County	VA-06-0030	No FY 78 Funds	Multi-year completed	Alan M. Voorhees, Inc.	Gran Paules (202) 426-9271
Dual Mode Transit Planning Case Study: Milwaukee	MA-06-0056	No FY 78 Funds	Multi-year completed	Cambridge Systematics, Inc.	Gran Paules (202) 426-9271
Census Software and Data Interface with UTPS	DC-06-0208	\$200,000	Multi-year continuing	Bureau of the Census	Tom Hillegass (202) 426-9271

Bibliography

This list of reports, computer tapes, and audio-visual presentations contains those published or made from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Materials not available through NTIS may be obtained through the technical contact listed in the project summary or through the UMTA office listed after each project title.

Finally, additional reports or materials relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

UTPS Software Package

(Computer Tape)
UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978 (revised periodically)

Characteristics of Urban Transportation Supply [CUTS]

(Also on UTPS Computer Tape)
UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978, PB 233-580/AS

Characteristics of Urban Transportation Demand [CUTD]

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978, UMTA-IT-06-0049-78-1

Travel Responses to Transportation System Changes

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978, PB 265-830/AS

Analyzing Transit Options for Small Urban Communities

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978, UMTA-IT-06-9020-78-1,2,3
3 vols.

Simplified Aids for Transportation Analysis
Vol. I, **Annotated Bibliography**

Vol. II, **Forecasting Auto Availability and Travel**

Vol. III, **Estimating Ridership and Cost**

Vol. IV, **Transit Route Evaluation**

Vol. V, **Estimating Parking Accumulation**

Vol. VI, **Fringe Parking Site Requirements**

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1979, UMTA-IT-06-9020-78-1,2,3,4,5,6

Dual Mode Transit Planning Case Studies:

Milwaukee Executive Summary

(Proj. MA-06-0056)

Orange County Executive Summary

(Proj. VA-06-0030)

Transit Sketch Planning Manual

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978

Modeling Demand-Responsive Feeder Systems in the UTPS Framework

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978, UMTA-MA-06-0049-78-9

Method for Estimating Patronage of Demand Responsive Transportation Systems

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978, DOT-TST-77-77

An Introduction to Travel Demand Forecasting: A Self-Instructional Test

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978

USS Transit Station Simulation Film

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978 (loan)

USS Transit Station Simulation User's Guide

Proj. MA-06-0010
UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978 (loan)

USS Transit Station Simulation Slide/Tape

Proj. MA-06-0039
UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978 (loan)

An Introduction to Urban Travel Demand Forecasting Slide/Tape

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978 (loan)

An Overview of Urban Transportation Planning Slide/Tape

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978 (loan)

Shirley Highway Data Set

UPM-20, Office of Planning Methods and Support
UMTA/DOT
1978

Special Planning Studies

Trends and Highlights



Projects undertaken by the Special Planning Studies Program are determined in large part by major UMTA policy directions and key issues identified in the implementation of UMTA's Technical Studies Grant Program. Each year, a portion of the funds available for technical studies is set aside for use in a variety of special planning studies. These special projects supplement the technical studies grants by allowing for study of local issues with national significance or for the development of procedures and methods having a wide application.

In FY 78, a number of new special planning studies were initiated to address concerns over the increasing cost of providing transit services and the potential transportation problems that could arise from energy supply shortages. These two concerns indicated the need for improved tools to assist local operators in making short-range planning decisions, and the need for the development of local level energy conservation contingency plans in case of an energy crisis.

The increasing inclusion of accessible buses in area transportation programs suggested the need for a method of evaluating accessible fixed-route service and developing guidelines for planning more accessible fixed-route service.

Other continuing projects include studies to provide better information on the cost effectiveness of new rapid rail transit, and studies to assist local areas to meet Transportation System Management (TSM) planning requirements. Approximately half of the special study projects were undertaken by local government agencies.

Rail Rapid Transit Impact Studies

UMTA has provided an increasing amount of funds for the development of relatively new rail rapid transit systems. An assessment of how these new systems affect regional development and the institutional environment is needed for future planning decisions at the local level and by UMTA.

During FY 78, the Bay Area Rapid Transit (BART) Impact Study (CA-09-0042, DC-09-9010) has concentrated on identifying and studying various areas of impact, including impact on travel behavior, the environment, economics and finance, institutions and life styles, land use and urban development, and public policy.

In each of these areas, a final project report has been developed describing the work undertaken, the specific results and some of their implications. In addition, a final program report summarizing the results of all individual projects is being prepared.

The Washington, D.C., Metropolitan Area Transit Authority (WMATA) Impact Study (IT-09-0086, IT-09-0097, DC-09-7001) continued travel behavior studies, an activity and development study, and a policy interpretation study. The travel behavior studies include efforts to make short-range forecasts of changes in commuting patterns, and to compare the results with those derived from existing forecast models. Mid-day travel changes and "induced" travel are also to be addressed. The activity and development study will monitor changes in such indicators as population and employment, re-

tail sales, property transfers, and land value development, and assess the relationship of these changes to the presence of WMATA. Finally, the policy interpretation study will attempt to catalogue the transportation-related goals and expectations held by citizens, planners, and local officials.

Draft papers were developed in several of these impact assessment areas in FY 78. A variety of reports discussing interim findings are expected from this project in the next fiscal year.

In Atlanta, Ga., the Metropolitan Atlanta Rapid Transit Authority (MARTA) Impact Study (GA-09-0037, GA-09-0038) has two components. The major component is a comprehensive assessment of the economic impacts of transportation on land use and is being conducted by the Atlanta Regional Commission (ARC). A second study, being undertaken by MARTA itself with funding passed through ARC, is to assess the institutional experience of MARTA in all phases of implementation.

Design for this effort was begun in 1977. During the later part of 1977, ARC began preparing for operation of the system by conducting an initial test effort using the East Line area as a pilot corridor. This work was completed in the spring of 1978. Since no actual system operation was underway at that time, the results set the background for the future operations. Little direct impact of construction on the land use factors studied was noted.

Work was also initiated on a detailed study design, broadening the effort to include a wider range of potential transportation impacts. A variety of base

data was collected using the new study design, in preparation for the opening of the system in 1979.

Transportation System Management Planning [TSM]

Transportation System Management (TSM) is a concept which involves the planning, programming and implementation of low-capital, short-range improvements designed to enhance the efficiency of existing transportation systems.

The TSM special planning studies are designed to assist localities in planning a wide range of TSM strategies which increase the efficiency of their transportation systems by 1) identifying the institutional arrangements which facilitate effective TSM planning and programming; 2) identifying factors important in the implementation of TSM projects; and 3) developing technical tools for use in TSM planning.

The TSM Prototype Planning Study (IT-09-0068) in Portland, Ore. is designed to formulate, apply and evaluate procedures for systematic TSM planning in an urban area, and to provide a basis for the ongoing process. The work includes rigorous technical analyses of a wide variety of transportation problems.

A similar project is the Kansas City TSM Prototype Planning Study (IT-09-0103, IT-09-0078). This study seeks to develop a set of procedures for TSM planning, to demonstrate these procedures in selected sub-areas, and to devise a



MARTA is studying the economic impact of its newly constructed rapid transit system on land use in the Atlanta area. Above is Avondale Station on MARTA's east rail line.

method for integrating these procedures into the overall planning process in the Kansas City area. During the first phase of the study, problems were identified for each study area, a set of proposed projects was developed addressing the problems identified, and a project report was written describing how the process would be integrated into a region's ongoing transportation planning process. The second phase of the study, initiated in FY 78, is designed to demonstrate the application of the proposed procedures on a regional scale. The regional TSM element report will be the final product.

The goal of the Seattle, Wash., TSM Prototype Planning Study (WA-09-0018) is to formulate, develop and evaluate a transportation management program for the King County sub-region of the Seattle metropolitan area, such that immediate, low-capital improvements may be accomplished to improve the system and resolve special problems. A key feature of this study will be the creation of the position of TSM coordinator who will be responsible for initiating and supporting the TSM process and for coordinating implementation of TSM projects throughout the subregion.

While the Seattle study used a TSM coordinator, the Middlesex County TSM Prototype Planning Study (IT-09-0089) in New Jersey will use a TSM Planning Task Force for each sub-area studied. After establishing a set of general goals for TSM in Middlesex County, a set of demonstration sub-areas were identified and a task force established. This task force was a combination of local jurisdiction staff and members of the Metropolitan Planning Organization (MPO). County staff



A TSM study in Middlesex County, N.J., resulted in a new off-peak bus service to the county's largest shopping center.

Planning Transportation for Elderly and Handicapped Persons

Section 16 (a) of the Urban Mass Transportation Act declares that it is "...national policy that elderly and handicapped persons have the same right as other persons to utilize mass transportation services, (and) that special efforts shall be made in the planning and design of mass transportation facilities and services so that the availability to elderly and handicapped persons of mass transportation which they can effectively utilize will be assured."

On April 30, 1976, UMTA promulgated planning regulations for the transportation of elderly and handicapped persons. In order to fulfill the "special efforts" requirement, the regulations require that both the location and the transportation needs of the elderly and handicapped be identified, in particular, the location and needs of wheelchair users and semi-ambulatory persons.

The regulations also recommend that, to the extent possible, quick and inexpensive data gathering methods be used for estimating the transportation demand among elderly and handicapped persons, with primary consideration given to self-identification techniques. However, there remain several issues vital to effective planning for which little information is available. Therefore, a number of special planning studies in this area have been initiated to 1) identify cost-effective approaches to data collection, 2) develop procedures for coordinating service, and 3)

members monitored the local transportation system to identify future problems. This process, together with the results of the local efforts, will be used to assess the success of the task force approach to subsequent TSM planning in the county.

Another continuing study is the Development of Methods for Evaluating TSM Alternatives (MA-09-9003). The purpose of this research is to assist UMTA in improving the capabilities of MPO's, transit operators, and other agencies in assessing the effects of alternative TSM

strategies. The focus of the research will be on simple techniques which are easily implemented without extensive computer capabilities. In developing alternative techniques, every effort will be made to provide a range of choices, with primary emphasis on simplicity, use of existing data, and practical relevance to the issues to be resolved. Another key element of the research will be to identify and summarize innovative methods that may be developed or applied to local agencies in their own planning and programming activities.

provide needed information on the effectiveness of various types of transportation services for elderly and handicapped people.

Eight different studies comprise this effort, and are designed to assist localities in meeting the elderly and handicapped planning requirements.

Four of the studies are related to data collection. In the study entitled Use of Existing Data in Elderly and Handicapped Transportation Planning (MD-09-9001), the objectives of the project include 1) identification and description of specific sources of usable data; 2) delineation of steps required to correct problems prior to use of such data; 3) identification of planning data that is required but is not likely to be obtainable through existing services; and 4) development of a manual for use of secondary sources for planning services for elderly and handicapped persons.

The goal of the study, Data Collection System for Planning Services for Elderly and Handicapped Persons (IT-09-9009), is to develop practical and effective data collection procedures which facilitate the ongoing planning of special services for elderly and handicapped persons and in particular for wheelchair users and semiambulatory persons. The specific objectives of the study include: 1) specifying the information requirements for special efforts planning; 2) determining that portion of planning which can be satisfied by using inexpensive data gathering methods and self-identification techniques; and 3) determining the essential primary data collection needed for special efforts planning. A related study, the Prototype Elderly and Handicapped

Planning Data Collection Study (CA-09-7001), is designed to develop a system for gathering information on the transportation needs of elderly and handicapped persons, again, particularly wheelchair users and semiambulatory persons, and to undertake a detailed test of the system proposed. This study will be coordinated with the national elderly and handicapped transportation demand study undertaken by the Office of Service and Methods Demonstrations. While the system is designed to fit local conditions and local needs, the emphasis of this study will also be on the application and testing of the system.

Another project, Self-Identification Techniques Prototype Study (WA-09-7001), is an attempt to learn from the techniques used by the City of Tacoma, Wash. for identifying the transportation needs of the elderly and handicapped and disseminating information on available services. The project will also assist the city in incorporating data from the self-identification efforts into a management information system for elderly and handicapped programs. The self-identification data is an integral part of the city's elderly and handicapped data system, and the project will enable the city and UMTA to evaluate the effectiveness of this approach.

One of the major results of the project will be a report describing Tacoma's methods for identifying the elderly and handicapped and how such information is used in assessing their mobility needs and in determining what services are provided to meet these needs. The document will evaluate the success or failure of the methods employed and will offer

recommendations about each of these methods.

In many urban areas, a wide range of transportation services exist to serve elderly and handicapped persons. Yet, because these services are not coordinated, the level of service provided is not commensurate with the resources being applied. Services are often duplicative, and gaps in service areas or in clientele sometimes mean that those persons most in need of transportation are not being served.

A continuing study, Planning for Coordination of Elderly and Handicapped Services (DC-09-9006), is being conducted by the Department of Health, Education and Welfare (HEW). This project is designed to provide case studies and a summary analysis of five demonstrations which are currently underway through HEW sponsorship. Coordination concepts will be examined to assess their feasibility. The potential impact on productivity and implementation techniques will also be examined.

Another study, Analysis of Existing Elderly and Handicapped Transportation Services (IT-09-9006), is attempting to determine what improved transportation services, particularly those services designed to accommodate wheelchair users and semi-ambulatory persons, have accomplished. The approach of this project consists of an assessment of 20 urban areas in which significant improvements have been made. Service changes will be described in detail, and an estimate of the consequences in terms of cost, street traffic, fares, organizational arrangements, financing and service levels, will be made.

The response of user groups to the implementation will also be described.

Two new studies were initiated in FY 78 related to the evaluation of existing accessible fixed-route services and the development of planning guidelines for new accessible, fixed-route services. A 12-month study in St. Louis, Mo., Accessible Bus Evaluation — St. Louis (IT-09-0102), is designed to evaluate the deployment of 157 accessible fixed-route buses on 17 routes. Activities in the study include evaluations of service reliability, maintenance, program economics, passenger acceptance and utilization. Possible coordination with an accessible, demand-responsive project which will operate in much the same area as the fixed-route, accessible service will also be evaluated under this study. Since experience with fixed-route, accessible service is limited and the Bi-State Development Agency in St. Louis is the first to employ so many accessible vehicles in fixed-route service, this effort is not only timely but critical to assuring that the accessible vehicles have the greatest impact on the mobility of transportation handicapped persons.

A related study, Planning for the Phase-In of Accessible Buses (IT-09-9010), is underway. For some time after delivery of the initial accessible buses, in each city, these vehicles will only be a portion of the total fleet. Thus, a primary focus of this project will be the development of guidelines for the assignment of these accessible vehicles as each area moves toward a totally accessible, fixed-route bus operation.

This study will include appropriate data collection, marketing, operations

coordination, and evaluation recommendations. The project will attempt to identify the scope of all critical concerns, appropriate timing, and recommendations on appropriate approaches. The recommendations from this project will be based, in part, on experiences with accessible bus projects in those cities that presently have accessible, fixed-route service, or are about to institute such service.

Energy Contingency Planning Prototype Studies

In recent years, with the increased possibility of shortages in petroleum supplies, attention has focused on the need for transportation contingency planning to maintain essential mobility. Studies in this area are designed to use the existing urban transportation planning process to marshal the necessary resources to effectively develop local level contingency transportation plans should there be an energy emergency.

The Kansas City (Mo.) Energy Contingency Planning Prototype Study (MO-09-7001) represents a comprehensive effort to develop a set of transportation strategies which could be applied in the case of an energy emergency. The initial step will involve an inventory of institutional constraints at all government levels. This will be followed by an evaluation of the current transportation system with respect to energy needs and usage patterns. A set of "crisis scenarios" will then be developed and an assessment will be made of methods for relating energy

shortages to travel behavior. Finally, a set of strategies for each shortage scenario will be developed. The involvement of local agencies throughout the process will be a key aspect of this project. Reports on all steps of the study are expected.

The Dallas-Fort Worth, Tex. area prepared an energy contingency plan using regular planning funds during 1977. That study indicated the need for further work in local participation and in the use of school buses and taxis during energy emergencies. As a result, the Dallas-Fort Worth Energy Contingency Planning Prototype Study (TX-09-7001) was initiated. This project represents the efforts of the North Central Texas Council of Governments to investigate the potential role of school buses and taxis in an energy contingency situation. This effort will include consideration of the legal, institutional and operational aspects of this potential.

The study will also incorporate local government energy policy into the process. It is hoped that local government staff may be enlisted into a network of "energy coordinators." This will help insure a realistic and effective strategy for energy contingencies.

Short-Range Transit Planning

The emphasis of transit planning has shifted from long-range planning and design of capital-intensive transit system improvements, to an emphasis on short-range, low-cost transit improvements that can effectively increase

the efficiency of the existing system. This change in emphasis requires the transit operator to make planning decisions in a manner quite different than in the past. The operator must have a much wider range of accurate and current information to enable continuing evaluation of an existing system.

Projects in this study area are designed to assist in transit planning by providing methods for data collection and analysis, and by developing training materials for transit operators and for Metropolitan Planning Organization (MPO) personnel on transit planning issues and methods.

The change in focus to short-range planning has increased the importance of transit system surveillance. A significant amount of information is necessary to properly evaluate system performance and identify potential improvements. This information includes data on patronage (boarding locations, travel patterns, transfers, etc.), level-of-service indicators (on-time performance, travel speeds, delay points, etc.) and revenue/cost performance.

Unfortunately, existing knowledge regarding this data collection is limited. Little is known about the types of data which should be collected, the methods which should be used, the frequency with which data should be collected, or how transit surveillance should be coordinated with other data collection activities. The Bus System Monitoring System (IT-09-9008) is a study designed to improve and advance transit surveillance techniques and procedures. This study has two objectives: 1) to develop a model monitoring system which will facilitate the

ongoing evaluation of existing transit services; and 2) to demonstrate that the model monitoring system is a practical and effective method for obtaining current information about existing service performance.

The final product of this research effort will be a monitoring manual. This manual will provide transit properties with a step-by-step procedure for implementing and maintaining the monitoring system. Reference will be made to appropriate Urban Transportation Planning Systems manuals and software pertaining to the processing of the surveillance data. (See Chapter 12.) Procedures will also be detailed for estimating manpower and cost requirements of the system.

The proposed system design will be tested and validated by the contractor at a transit operating site selected by UMTA. The contractor will be responsible for the overall design of the system demonstration. However, the details of the demonstration will be jointly developed by the contractor, UMTA and the operator.

Two transit surveillance prototype studies — Boston (MA-09-7001) and Norfolk (VA-09-7001) — have been initiated to provide transit operators with a systematic evaluation method which can measure existing service performance, identify new potential areas of transit, and provide insight into the analysis of service alternatives.

Specifically, the studies' objectives are: 1) to develop a service evaluation system which utilizes existing planning techniques for the identification of new and improved bus service opportunities; and 2) to test and verify that such a service evaluation is a practical and effective

method for service evaluation. The Boston project is focusing on the needs of larger systems, while in Norfolk the requirements of small- to medium-sized operators will be assessed.

An effective transit planner needs a good working knowledge of all areas of transit operations. These areas include service planning, scheduling, maintenance, finance, and facility design. In many cases, new planners do not receive any training in operations and must learn through experience. The need exists for coordinated training courses to be developed for new transit planners. These courses should provide new planners with basic knowledge and an understanding of transit operations.

A course in Transit Operations and Planning (IT-09-9011) is a project to: 1) develop a training course which will provide the necessary background knowledge and understanding of transit operations to individuals in entry level positions in transit planning; and 2) demonstrate that the training course is a practical and effective method for educating entry level transit planners.

The work to be undertaken will be in two phases. In Phase I the needs of new transit planners will be determined and a course outline designed to meet these needs. In Phase II, the materials for the training course will be developed. These materials will be tested and validated by the contractor through a trial course.

Special Planning Studies

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
RAIL RAPID TRANSIT IMPACT STUDIES					
Bay Area Rapid Transit (BART) Impact Study	CA-09-0042 DC-09-9010	\$540,000	March 1977- March 1979	Metropolitan Transportation Commission, Calif.	Richard Steinmann (202) 426-2360
Washington Metropolitan Area Transit Authority (WMATA) Impact Study	DC-09-7001 IT-09-0086 IT-09-0097	\$743,945	May 1977- July 1979	Metropolitan Washington Council of Governments, Washington, D.C.	Richard Steinmann (202) 426-2360
Metropolitan Atlanta Rapid Transit Authority (MARTA) Impact Study	GA-09-0037 GA-09-0038	\$231,592	Sept. 1977- July 1979	Atlanta Regional Commission, Ga.	Richard Steinmann (202) 426-2360
TRANSPORTATION SYSTEM MANAGEMENT PLANNING [TSM]					
Portland, Oregon TSM Prototype Planning Study	IT-09-0068	\$60,000	Nov. 1976- July 1978	Columbia Regional Association of Governments, Ore.	Richard Steinmann (202) 426-2360
Kansas City TSM Prototype Planning Study	IT-09-0103 IT-09-0078	\$115,000	Jan. 1977- March 1979	Mid-America Regional Council, Mo.	Richard Steinmann (202) 426-2360
Seattle TSM Prototype Planning Study	WA-09-0018	\$80,240	Sept. 1978- March 1979	Puget Sound Council of Governments, Wash.	Richard Steinmann (202) 426-2360
Middlesex County TSM Prototype Planning Study	IT-09-0089	\$60,000	July 1977- March 1979	Middlesex County Planning Board, N.J., through Tri-State Regional Planning Commission	Richard Steinmann (202) 426-2360
Development of Methods for Evaluation of TSM Alternatives	MA-09-9003	\$80,000	Sept. 1977- Jan. 1979	MIT, Center for Transportation Studies	Granville E. Paules (202) 426-9271

Special Planning Studies

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
PLANNING FOR TRANSPORTATION FOR ELDERLY AND HANDICAPPED PERSONS					
Use of Existing Data in Elderly and Handicapped Transportation Planning	MD-09-9001	\$38,100	June 1977- Oct. 1979	Verve Research Corp.	Kathleen M. Koss (202) 426-2360
Data Collection System for Planning Services for Elderly and Handicapped Persons	IT-09-9009	\$220,000	Nov. 1977- Dec. 1979	To be selected	Brian E. McCollom (202) 426-2360
Prototype Elderly and Handicapped Planning Data Collection Study-San Diego	CA-09-7001	\$98,014	March 1978- July 1979	Comprehensive Planning Organization, San Diego	Brian E. McCollom (202) 426-2360
Self-Identification Techniques Prototype Study	WA-09-7001	\$43,650	May 1978- May 1979	City of Tacoma, Wash.	Kathleen M. Koss (202) 426-2360
Planning for Coordination of Elderly and Handicapped Services	DC-09-9006	\$60,000	Sept. 1977- March 1979	HEW, Office of Human Development	Kathleen M. Koss (202) 426-2360
Analysis of Existing Elderly and Handicapped Services	IT-09-9006	\$250,000	Sept. 1977- Jan. 1980	National Institute for Advanced Studies	Richard Steinmann (202) 426-2360
Accessible Bus Evaluation: St. Louis	IT-09-0102	\$103,000	March 1978- March 1979	Bi-State Development Agency through West Gateway Coordinating Council, Mo.	Kathleen M. Koss (202) 426-2360
Planning for the Phase-In of Accessible Buses	IT-09-9010	\$225,000	May 1978- March 1980	To be selected	Kathleen M. Koss (202) 426-2360

Special Planning Studies

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
ENERGY CONTINGENCY PLANNING PROTOTYPE STUDIES					
Kansas City Energy Contingency Planning Prototype Study	MO-09-7001	\$75,000	May 1978- Sept. 1979	Mid-America Regional Council, Mo.	Richard Steinmann (202) 426-2360
Dallas-Fort Worth Energy Contingency Planning Prototype Study	TX-09-7001	\$70,000	June 1978- Dec. 1979	North Central Texas Council of Governments	Richard Steinmann (202) 426-2360
SHORT-RANGE TRANSIT PLANNING					
Bus System Monitoring System	IT-09-9008	\$150,000	Jan. 1978- Dec. 1979	Multisystems, Inc.; ATE Management and Service Co.	Brian E. McCollom (202) 426-2360
Transit Surveillance Prototype Study: Boston	MA-09-7001	\$130,400	June 1978- July 1979	Massachusetts Bay Transportation Authority (MBTA)	Brian E. McCollom (202) 426-2360
Transit Surveillance Prototype Study: Norfolk	VA-09-7001	\$47,104	June 1978- July 1979	Tidewater Transportation District Commission, Va.	Brian E. McCollom (202) 426-2360
Course in Transit Operations and Planning	IT-09-9011	\$50,000	Sept. 1978- Feb. 1979	To be selected	Brian E. McCollom (202) 426-2360

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports

may be ordered through NTIS by using the order blanks provided at the back of this document.

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project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

Urban Mass Transportation Abstracts: Volume No. 4

Proj. TRIC-77-1

Urban Mass Transportation Administration
December 1977, PB 278-646/AS

Urban Mass Transportation Abstracts: Volume No. 3

Proj. TRIC-76-1

Urban Mass Transportation Administration
July 1976, PB 264-905/AS

A Selected Bibliography and Reference Document in Urban Public Transportation

Proj. DC-06-0114

JHK and Associates
July 1976, PB 266-252/AS

Environmental Impacts of BART: Interim Service Findings

Proj. CA-09-0042

Gruen Associates and DeLeuw Cather and Co.
January 1976, PB 257-498/AS

Impacts of BART on the Social Environment: Interim Service Findings

Proj. CA-09-0042

Gruen Associates and DeLeuw Cather and Co.
March 1976, PB 257-510/AS

Impacts of BART on Visual Quality: Interim Service Findings

Proj. CA-09-0042

Gruen Associates
March 1976, PB 257-509/AS

Transportation and Travel Impacts of BART: Interim Service Findings

Proj. CA-09-0042

Peat, Marwick, Mitchell and Co.
April 1976, PB 261-017/AS

Urban Densities for Public Transportation

Proj. IT-09-0023

Tri-State Regional Planning Commission
May 1976, PB 256-636/AS

Impacts of BART on Bay Area Health Care Institutions

Proj. CA-09-0042

Jefferson Associates
March 1977, PB 266-614/AS

BART Impacts on Highway Traffic and Transit Ridership

Proj. CA-09-0042

Peat, Marwick, Mitchell and Co.
May 1977, PB 267-675/AS

Impacts of BART on Bay Area Political Institutions

Proj. CA-09-0042

Jefferson Associates
May 1977, PB 273-389/AS

Impacts of BART on Bay Area Institutions of Higher Education and Their Students

Proj. CA-09-0042

Dr. Terry Lunsford
May 1977, PB 273-396/AS

The Impact of BART's Bond Issue on Regional Public Financing

Proj. CA-09-0042

Raymond K. O'Neil and Charles A. Long
August 1977, PB 273-387/AS

Impacts of BART on the Competitive Advantage and Efficiency of Bay Area Business Operations

Proj. CA-09-0042

McDonald and Smart, Inc.
August 1977, PB 273-485/AS

Standard for Bus Service Contract Payments and a System of Incentives

Proj. IT-09-0058

Simpson and Curtin
December 1976, PB 269-054/AS

An Analysis of Transportation Planning Effectiveness: Final Report

Proj. MA-09-9003

Transportation Systems Center
July 1977, PB 272-756/AS

Magic Carpet Evaluation Study: Final Report

Proj. WA-09-0012

Municipality of Metropolitan Seattle
May 1977, PB 271-214

A Metropolitan Transportation Plan for National Energy Contingencies

Proj. TX-09-7001

North Central Texas Council of Governments
August 1977

TSM Prototype Process Study: Working Paper

Proj. IT-09-0103, IT-09-0078

JBM and Associates for Mid-America Regional Council
March 1978

Transit Impact Monitoring Program, Results of East Line Pilot Project 1970-1976: Executive Summary and Technical Appendix

Proj. GA-09-0037, GA-09-0038

Atlanta Regional Commission
April 1978

Changing Transit Goals Due to METRO Rail: Draft Report

Proj. DC-09-7001, IT-09-0086, IT-09-0097

Metropolitan Washington Council of Governments
July 1978

TSM Prototype Study: Final Report

Proj. IT-06-0068

Columbia Regional Council of Governments
July 1978

Transportation Management

Trends and Highlights



Management skills and techniques to improve the productivity of urban transportation are developed through UMTA's Transportation Management Program. In FY 78, this program began to emphasize the dissemination of information and the implementation of existing techniques through workshops, seminars, "outreach programs," and information service programs.

The Office of Transportation Management is divided into four units, each of which is responsible for a number of new and continuing programs. These four units are: 1) Human Resources Division; 2) Marketing Division; 3) Operations and Maintenance Division; and 4) Information Services Division.

Human Resources Division

Among the projects conducted by the Human Resources Division in FY 78 has been the Transit Industry Employee Training Program (WV-06-0011). This program will develop modular training units for all phases of bus transit blue collar work and develop a mechanism for industry-wide distribution of these training materials.

In another educational project, the Joint FHWA/UMTA Training Agreement (DC-06-0150), UMTA and the Federal Highway Administration are working together to identify and develop training programs responsive to the needs of professionals in urban transportation fields. Special attention is given to highway



Transit employees in Huntington, W. Va., field test the Emergency and Accident Procedures module developed by the AFL-CIO Appalachian Council Transit Employee Training Project after classroom training

professionals making career changes into the field of public transit.

The National Transit Intern Project (DC-06-0180) is a comprehensive pilot project designed to attract and recruit college graduates for placement in entry-level administrative and professional positions in the transit industry.

A project entitled State DOT Role in Urban Transportation Training and Education (CA-06-0082) will analyze, develop, and demonstrate the state's role

in providing training for selected groups at the state and local levels.

Evaluation of the Feasibility of Developing a Bus Operator Training Simulator (MA-06-0074) will examine the use of a simulator as a means of teaching safe driving and other operating techniques to bus operators. The effect of using a simulator in training to conserve fuel and to minimize the risk of accident or equipment damage will also be evaluated.

Bus Operator Validated Test Battery (MA-06-0011) is a continuing project to

develop and establish valid procedures for the selection of male and female applicants who would have the most potential for successful performance as public transit bus operators.

A set of Case Studies in Human Resources Management in Public Transportation (PA-06-0045) will be developed to increase the knowledge and awareness of public transit officials, educators, and researchers about transit industry human resources, management practices, and procedures.

Employee Absenteeism and Workmen's Compensation Claims in the Transit Industry (PA-06-0050) is a project intended to establish a baseline of transit industry experience with employee absenteeism and workmen's compensation and to develop a series of recommendations on ways to deal with employee excesses in these areas. A

related project, Comprehensive Employee Assistance Program (MI-06-0019), is aimed at establishing a framework of policies and procedures to enable public transit employers to address and resolve personnel problems that affect worker productivity. This effort will also involve a review of current and outstanding industry programs in this area.

Marketing Division

Programs in the Marketing Division are concerned with assisting the transit operator by developing transit marketing techniques, with increased attention paid to the specialized marketing requirements of paratransit services, and by providing a marketing skills enrichment program which

DON'T TAKE YOUR CAR SHOPPING. TAKE OURS.



Take the bus. It goes where you shop. There are new routes to the shopping centers at Rivergate Mall, 100 Oaks and Green Hills.

There are more buses running on weekdays and Saturday.

There's Shop 'n' Shop service, never has made it faster. You can get to your shopping and get home in the same direction without paying another fare.

The buses are new, comfortable, air conditioned, and you won't have to worry about traffic, parking or gas.

Get a bargain before you're shopping. Take the bus.

NASHVILLE'S ECONOMY CAR

mta
242-4433

IF TAKING YOUR CAR ON SHOPPING TRIPS GIVES YOU A HEADACHE, TAKE ONE OF THESE.

They're Baltimore buses. And they're the only way to get to the shopping centers in Baltimore.

Take the bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore.

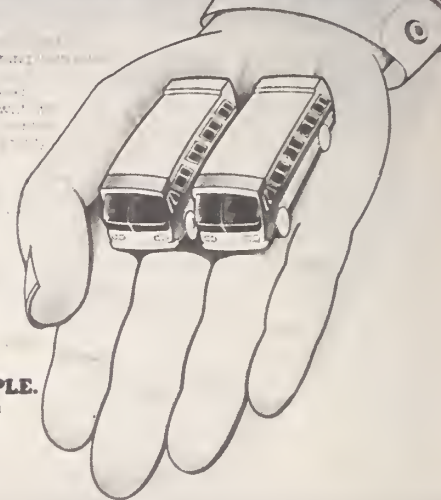
There's a bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore.

There's a bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore. There's a bus to the shopping centers in Baltimore.

THE BALTIMORE BUS PEOPLE.

We're moving in the right direction.

539-5000



Two samples of transit promotion efforts are shown here.

could lead to more effective job performance and delivery of transit services.

The principal objectives of one ongoing project, the Transit Marketing Project (IT-06-0078) are: 1) to define and demonstrate a comprehensive methodology for marketing transit service; 2) to upgrade and test state-of-the-art marketing techniques, and 3) to develop new techniques. Two site-specific demonstration grants were also part of this effort, one in Baltimore, Md. (MD-06-0021), and the other in Nashville, Tenn. (TN-06-0007). The contractor is currently evaluating the results and preparing a final report. Reports on the *Transit Marketing Management Handbook* series, also a product of this project, are in final preparation. The contractor is also producing two "how-to" research handbooks: *How to Conduct a Market-Wide Strategic Study and Analysis* and *How to Conduct a Limited Area Incentive Study*.

The Transit Marketing Education Development Project (CA-06-0110) is also continuing. The first phase of this project involved the design, presentation and evaluation of a two-week intensive training course for transit marketing practitioners. This Applied Transit Marketing course was conducted in March 1978. It focused on all phases of the marketing process, with special emphasis on the application of marketing techniques in the transit environment.

The second phase of this project is the development of an educational transit marketing curriculum based on the refined model developed for the Applied Transit Marketing course. The package will be available in 1979. It will be organized in

modules covering main course components. Each module will include an overview of the topic area, learning objectives for participants, suggested teaching and presentation methods, subject content as edited from the two-week course, application exercises and case studies, and suggested reading materials.

Another project funded in FY 78 was the Transit Marketing Information Exchange Project (IT-06-0238). This project is designed to improve the exchange of existing transit marketing materials within the transit community, to provide a clearinghouse for the materials, and to reduce or eliminate excessive expenditures of time, effort, and dollars spent in investigating state-of-the-art programs and techniques. In FY 79 a contractor will be selected to develop a compendium of marketing materials and to design a clearinghouse activity.

Operations and Maintenance Division

The purpose of one project, Automatic Bus Diagnostic System (IT-06-0102), is to develop, demonstrate and evaluate an automated bus inspection system. The project was intended to measure, analyze and report data pertinent to routine servicing of transit buses. Considerable time has elapsed since the initial grant was awarded in 1975. The benefits to be derived from implementation of this project must first be assessed before any additional costs are incurred.

A new project in FY 78 was Regional Productivity Seminars (DC-06-0023). Five

regional seminars were held to identify and document specific actions which have occurred in the transit community to improve transit system productivity.

A Maintenance Needs Analysis (OH-06-0079) project is also underway. This project will assess the existing levels of maintenance productivity and recommend demonstrations to solve certain maintenance productivity problems through improved maintenance manuals and training techniques.

A continuing project, Transit Security Demonstration (IL-06-0032), will demonstrate the effectiveness of security devices and techniques at selected elevated rail stations of the Chicago Transit Authority (CTA) by using state-of-the-art technology. The specific objectives of this project are to: 1) demonstrate a method of offering a sense of security to the rider while in the stations, 2) increase CTA ridership, and 3) reduce Chicago Police Department manpower costs associated with policing the selected demonstration stations. Bids for hardware acquisition have been received and evaluated.

Another continuing project, Public Transit Risk Management (IT-06-0173), is designed to study the insurance situation among a cross section of transit properties. The scope of the study includes a) insurance market availability, b) scope of coverage, c) cost of insurance programs, and d) insurance market capacities. The project will investigate risk management as it relates to the emerging changes in urban transit systems including the economic, social and technical aspects.

The Vehicle Rehabilitation Study (IT-06-0032) will examine the feasibility of purchasing rebuilt buses as an alternative

to purchasing new buses. This project will catalogue bus rebuilding sources, analyze various rebuilt components (e.g., frames, bodies, interiors, engines, transmissions, etc.), and compare the estimated cost of rebuilt versus new buses. The data collected will be related to federal policies on purchasing mass transit equipment.

The Maintenance Manual Specification Project (IT-06-0235) will create terms for acquiring maintenance manuals or job performance aids to improve maintenance productivity and reduce repair errors.

A computer software project entitled Run Cutting and Scheduling, (RUCUS) (MA-06-0046), has produced a software system which provides transit operators with an automated system for vehicle-scheduling and driver run-cutting. The implementation of the RUCUS system has usually resulted in transit operators being better able to cover all route assignments with fewer vehicles and less manpower. As this project progresses, a system study will be conducted to modernize the existing RUCUS package.

Rail Management Information System (MA-06-0074) is a continuing project designed to conduct a comprehensive analysis of transit operations and maintenance functions, and to assess the application of various management systems. The initial emphasis of the project will be directed toward light rail systems. This project will also evaluate the feasibility of developing a simulator for training bus drivers.

Three projects relate to Section 15 of the Urban Mass Transportation Act which requires that the reporting of financial and operating information by public transporta-

tion systems be done in uniform categories and with a uniform system of accounts and records.

The Manual System for Section 15 (IT-06-0210) will develop a handbook establishing procedures and a data recording system to assist small transit operators in meeting the Section 15 data reporting requirements.

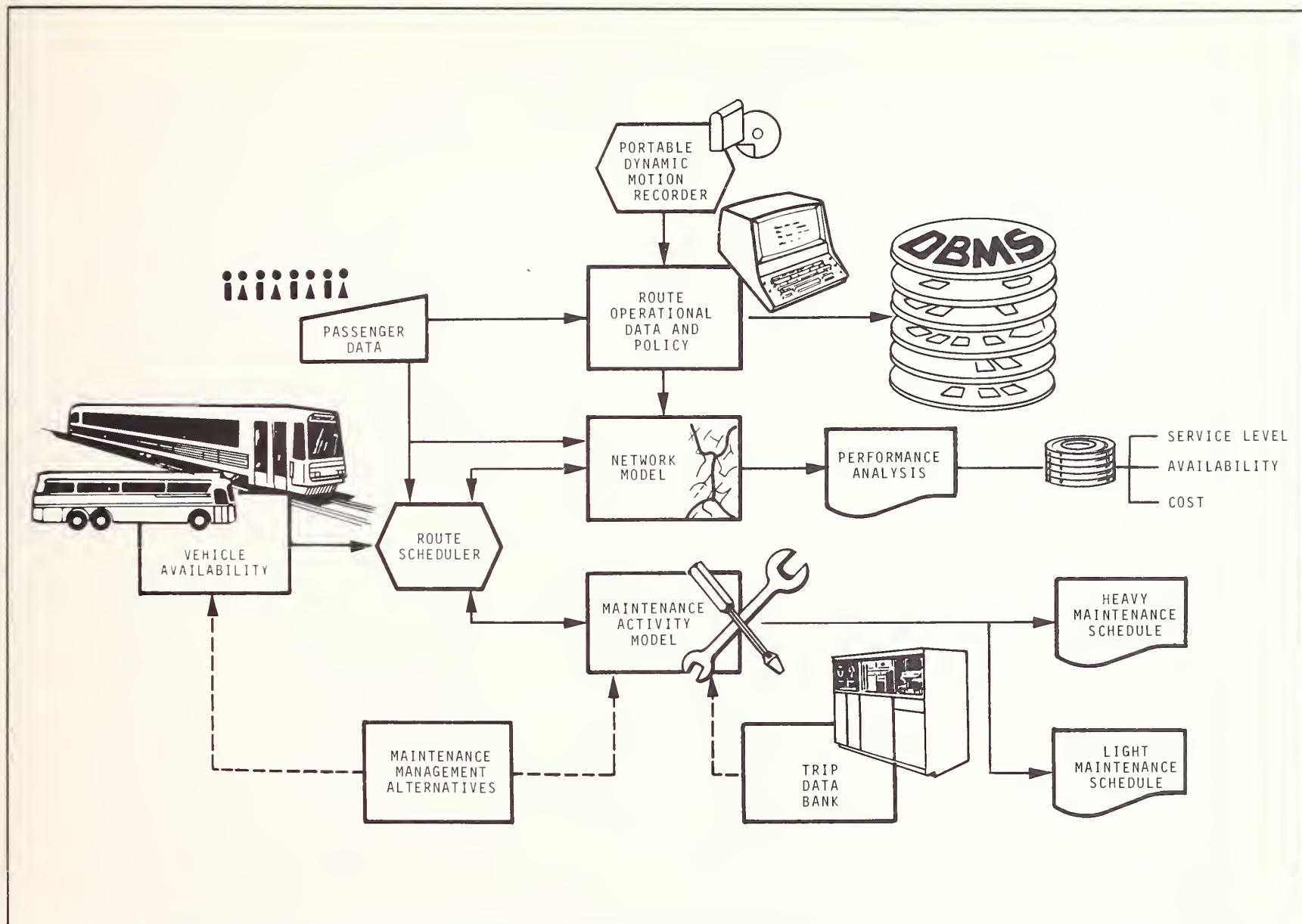
Project FARE, Task V (IT-06-0094) will examine the results of a previous study in which a uniform system of accounts and records was developed, as well as a reporting system for use in response to the Section 15 mandate. This new project, Task V, will evaluate the suitability of the reporting materials. This evaluation will be done in consultation with transit operators.

Section 15 Processing System (DC-06-0201) is a project to develop a software system for maintaining a national Section 15 reporting system data base. The software will also generate routine sets of quarterly and annual reports to be distributed to members of the reporting system. In addition, the system will have the capability to respond to ad hoc requests for information.

TRIC soon will become the repository for all national operating data reported under the provisions of Section 15. As planned staff expansion takes place during the coming year, this division will also be developed into a general outreach arm for all UMTA offices, thereby assisting in the overall theme of making the results of past research and demonstrations available to users.

Information Services Division

This unit has been known as the Transit Research Information Center (TRIC) and serves as UMTA's contact with the National Technical Information Service in Springfield, Va. TRIC reviews and prepares abstracts for all major UMTA research projects and publishes and distributes these abstracts periodically.



This operational model developed under the Transit Operations and Maintenance Management Support Program predicts the day-to-day operations of bus and rapid transit routes, and accumulates cost and performance data for future analysis.

Transportation Management

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
HUMAN RESOURCES DIVISION					
Transit Industry Employee Training Program	WV-06-0011	\$1,364,651 (to date)	Ongoing	AFL-CIO Appalachian Council, W. Va.	Charles T. Morison, Jr. (202) 426-9274
Joint FHWA/UMTA Training Agreement	DC-06-0150	\$200,000	Ongoing	JHK Associates	Charles T. Morison, Jr. (202) 426-9274
National Transit Intern Project	DC-06-0180	\$272,241	Ongoing	National Center for Internship Programs	Charles T. Morison, Jr. (202) 426-9274
State DOT Role in Urban Transportation Training and Education	CA-06-0082	\$99,276	Ongoing	CALTRANS	Charles T. Morison, Jr. (202) 426-9274
Evaluation of the Feasibility of Developing a Bus Operator Training Simulator	MA-06-0074	\$75,000	Oct. 1978- Sept. 1979	TSC	Charles T. Morison, Jr. (202) 426-9274
Bus Operator Validated Test Battery	MA-06-0011	\$584,618 (to date)	Ongoing	Massachusetts Bay Transportation Authority (MBTA)	Frank E. Enty (202) 426-9274
Case Studies in Human Resources Management in Public Transportation	PA-06-0045	\$30,150 (to date)	Ongoing	University of Pennsylvania	Frank E. Enty (202) 426-9274
Employee Absenteeism and Workmen's Compensation Claims in the Transit Industry	PA-06-0050	\$176,000	Ongoing	Port Authority of Allegheny County, Pa.	Frank E. Enty (202) 426-9274
Comprehensive Employee Assistance Program	MI-06-0019	\$156,000	Ongoing	Detroit Dept. of Transportation, Mich.	Frank E. Enty (202) 426-9274

Transportation Management

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
Marketing Division					
Transit Marketing Project	IT-06-0078	\$1,112,663	March 1974- July 1979	Grey Advertising, Inc.	Carol S. Eisen (202) 426-9274
Transit Marketing Educational Development Project	CA-06-0110	\$65,500	Oct. 1977- Jan. 1979	University of Southern California	Carol S. Eisen (202) 426-9274
Transit Market Information Exchange Project	IT-06-0238	\$50,000 to \$100,000	To be determined	To be selected	Carol S. Eisen (202) 426-9274
OPERATIONS AND MAINTENANCE DIVISION					
Automatic Bus Diagnostic System	IT-06-0102	\$210,000	Ongoing	Tri-State Regional Planning Commission, N.Y.	A.B. Hallman (202) 426-9274
Regional Productivity Seminars	DC-06-0023	\$166,411	Sept. 1978- Sept. 1979	Public Technology, Inc.	Brian Cudahy (202) 426-9274
Maintenance Needs Analysis	OH-06-0029	\$88,414	Oct. 1978- Oct. 1979	Southern Ohio Regional Transit Authority (SORTA)	A.B. Hallman (202) 426-9274
Transit Security Demonstration	IL-06-0032	\$630,080	July 1976- Sept. 1979	City of Chicago, Ill.	Gwen Cooper (202) 426-9274
Public Risk Management	IT-06-0173	\$164,982	Ongoing	Fred S. James and Co.	A.B. Hallman (202) 426-9274
Vehicle Rehabilitation	IT-06-0232	\$60,000	To be determined	To be selected	A.B. Hallman (202) 426-9274
Maintenance Manual Specification	IT-06-0235	\$200,000	To be determined	To be selected	A.B. Hallman (202) 426-9274
RUCUS, Sims	MA-06-0046	\$860,000	Ongoing	TSC	A.B. Hallman (202) 426-9274

Transportation Management

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
OPERATIONS AND MAINTENANCE DIVISION					
Rail System MIS	MA-06-0074	\$756,000	Ongoing	TSC	A.B. Hallman (202) 426-9274
Manual System for Section 15	IT-06-0210	\$159,855	To be determined	Forward Management Association	A.B. Hallman (202) 426-9274
Project Fare, Task V	IT-06-0094	\$860,000	June 1973- June 1979	Arthur Anderson and Co.	A.B. Hallman (202) 426-9274
Section 15 Processing System	DC-06-0201	\$272,000	May 1978- June 1979	International Business Service, Inc.	A.B. Hallman (202) 426-9274
INFORMATION SERVICES DIVISION					
MPO Data for Section 15	IT-06-0234		To be determined	To be selected	D.M. Chapman (202) 426-9274

Bibliography

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A Program for Improving Transit Industry Management Information Systems

Proj. IT-06-0094

Arthur Anderson and Company
September 1976

Vol. I **Information Systems Improvement Plans Summary**, PB 264-524/AS

Vol. II, **Systems Development Work Programs**, PB 264-525/AS

Vol. III, **Systems Design Reference Manual**, PB 264-526/AS

Final Report, PB 264-523/AS
Urban Mass Transportation Industry Uniform System of Accounts and Records and Reporting System
Proj. IT-06-0094
Arthur Anderson and Company
January 1977
Vol. I, **General Description**, PB 264-877/AS
Vol. II, **Uniform System of Accounts and Records**, PB 264-878/AS
Vol. III, **Reporting System Forms and Instructions: Required**, PB 264-879/AS
Vol. IV, **Reporting System Forms and Instructions: Voluntary**,
PB 264-880/AS

Transit Marketing Management Handbook: User Information Aids

Proj. IT-06-0078
Ilium Associates, Inc.
November 1975

Transit Marketing Management Handbook: Marketing Organization

Proj. IT-06-0078
Lesko Associates
November 1975

Transit Marketing Management Handbook: Pricing

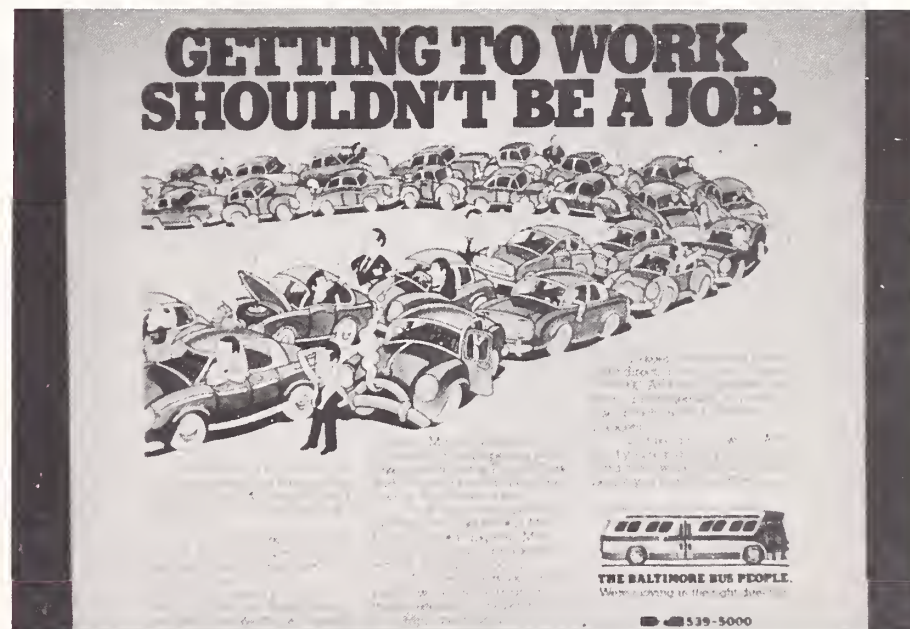
Proj. IT-06-0078
Grey Advertising, Inc.
April 1976

Transit Marketing Management Handbook: Marketing Plan

Proj. IT-06-0078
Grey Advertising, Inc.
April 1976

The Transit Marketing Project: Summary of Consumer Research, Baltimore MTA and Nashville MTA

Proj. IT-06-0078
Grey Advertising, Inc.
June 1976



An example of promotional materials used to attract riders in Baltimore, Md., is shown above.



SECTION FOUR
Policy Development
and Research

Policy Development and Research

The primary purpose of research in the field of policy development is to promote a better understanding of the emerging issues, needs and objectives involved in urban transportation; to monitor and evaluate the effectiveness of UMTA programs; and to aid in the formulation of new policies and program directions.

Chapter 15 describes studies which are funded under Section 6 of the Urban Mass Transportation Act to support the formulation of programs and policies. The studies are grouped by responsible office.

Under the Office of Policy Development, projects focus on the development of policies and programs relating to such issues as private versus public transportation services, the potential effect of transit projects on urban development, and transportation accessibility to the elderly and handicapped.

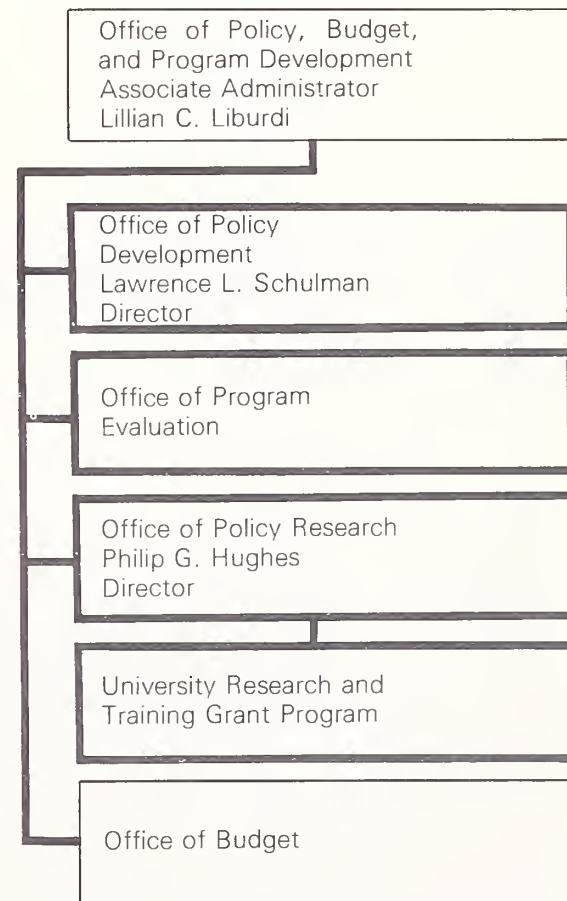
The Office of Evaluation conducts assessments of UMTA programs, such as the formula assistance and rail modernization programs, and is involved in the development of performance measures and the analysis and evaluation of transit trends.

The Office of Policy Research

performs studies and analyses designed to explore and resolve urban transportation problems and to aid in formulating policy and program decisions at the federal level. Studies have focused on such issues as transportation and land use interactions, productivity, financing, energy conservation, center city and low-density service problems, and the accessibility of transportation for the elderly and handicapped.

The Office of Policy Research is also responsible for directing UMTA's University Research and Training Grant Program which is described in Chapter 16. Grants to universities are authorized under Section 11 of the Urban Mass Transportation Act. Grants are awarded to universities throughout the country in an effort to support research in the field of transportation, to provide training for transportation professionals, and to encourage universities to become involved in the field of transportation as a source of advice, observation and evaluation.

The organization of the Office of Policy, Budget and Program Development is shown below. The projects described in this section are funded and administered through the program offices indicated in bold outline on the chart.



Policy and Program Development

Trends and Highlights



The Office of Policy, Budget and Program Development is responsible for planning, coordinating, and evaluating UMTA programs, as well as developing its budget. The office is also charged with policy analysis and with helping to formulate national transportation legislation and major DOT and UMTA policies, regulations and directives.

The long range goal of the office is to gain a better understanding of the issues involved in the provision, and public support, of local transportation services and to improve the capability of federal programs and policies to address these issues. The primary concern of the office is to develop policies and programs, guidelines and procedures which are responsive to local needs, anticipate emerging issues, and are based on effective monitoring and evaluation of transportation system performance. These activities lead to a continual assessment of current federal programs.

The efforts of this office have contributed to the development of a number of recent policy and program initiatives. Among these are: the policy on major investment decisions (alternatives analysis); paratransit services; joint development and value capture strategies; non-urbanized area assistance; rail modernization; role of private operators in public transportation; elderly and handicapped transportation needs; energy conservation; neighborhood revitalization; and transportation system management strategies.

The office comprises four functional components: policy development, program evaluation, policy research, and budget. The Office of Policy Research also

administers the University Research and Training Grant Program described in Chapter 16.

Office of Policy Development

The functions of the Office of Policy Development fall into four major areas:

- **Legislation.** The development of the UMTA legislative agenda and the coordination and monitoring of the legislative implementation process.
- **Budget.** Policy related budget activity and oversight and coordination of the initial aspects of budget preparation.
- **Policy Development.** The implementation and management of the overall policy development process within UMTA, and the drafting of specific statements of policy.
- **Program Development.** The initiation of new program elements or refinements of current programs, and the coordination of program elements within UMTA.

In 1978, issues studied with a view toward improving or developing UMTA policies and programs included urban and rural transportation funding and financing requirements, joint development projects, UMTA planning grant priorities, surveys of available transportation services in several different categories, and an investigation of the components that make up a successful paratransit system.

Attempts to develop a strong transit program in many different operating

situations led the office to fund a study entitled The County Role in the Provision of Public Transportation in Nonurbanized Areas (IT-06-0160). The study established a profile of county duties and responsibilities, assessed the role of counties in providing public transportation, and outlined the potential of increased county involvement in providing public transportation. Through a number of case studies, the project also evaluated the county as a coordinator or administrator for the preparation of transit development programs in non-urbanized areas.

To collect additional background information, another project, Survey of Public Transportation Services in Small Urban Areas (DC-06-0155), was designed to aid in the development of UMTA policies. The project, begun in FY 78, will survey the transportation services and vehicles available in urban areas of between 25,000 and 50,000 residents and in a sample of other communities with populations between 10,000 and 50,000.

A policy development issue was studied by UMTA in a project entitled Assessment of Conventional and Innovative Methods for Financing Public Transportation (IT-06-0127). In this project, which began in FY 77, an assessment was made of the ways in which public transit systems could be financed, including such programs as tax increment assessment, value capture, joint development, etc. The assessments will be published to provide guidelines to local officials for evaluating and implementing attractive methods for funding transit programs. In FY 78, the project was amended to develop a mechanism for a loan guarantee program for joint development efforts.

Another project, Assessment of the State Use of Section 9 Funds (DC-06-0132), was undertaken to determine how Section 9 Planning Assistance funds had been used and how their use related to the goals of UMTA programs. Comparisons between states were made to evaluate the extent to which different techniques and philosophies influenced the various state programs. The results of the study will be used by the policy development office in its attempt to develop and refine Section 9 planning grants.

The development of land for commercial or community purposes in and around transit facilities is called joint development, often with the added aspect of value capture. UMTA, in an effort to help transit properties and municipalities maximize the financial return on community land, funded a project entitled Joint Development: A Value Capture Project (NY-06-0214) which established a team of specialists to assist cities in achieving the necessary cooperation and coordination of the different components of joint development projects.

In another joint development/value capture project, an information sharing conference on Joint Development and Multi-Agency Funding (DC-06-0214) was held. Called "The Marketplace," the three-day Washington, D.C. conference included representatives from 37 participating cities, approximately 100 private developers and investment firms, and UMTA and other transportation officials. The purpose was to present and exchange information on the various opportunities and potential for joint transit/urban development projects.

Three projects were undertaken to assist in the development of paratransit systems. One was a technical study; the other two were information and guidance projects.

The technical study, Liability and Casualty Insurance for Paratransit Providers (MD-06-0030), examined the reasons and justifications for the sharp increase in insurance rates, and for the decline in the general availability of that insurance. The study was also designed to provide guidance for operators in obtaining insurance and in the broader area of risk and management.

The Paratransit Implementation Guidance and Reference project (MD-06-0034) produced information for private paratransit operators and planners regarding the participation of taxi and other private paratransit carriers in local mass transportation planning. The documents, and annotated bibliography and program participation primer, feature case studies and focus on the structure of federal programs and requirements, private participation, regulatory change, competition between potential service providers, contractual arrangements, and the coordination of special services.

A third paratransit-related project, Support of Regional Workshops on Paratransit Implementation (DC-06-0210), was developed to conduct regional workshops on the implementation of UMTA's paratransit policy. Case studies and other materials were prepared for the workshops. However, planning for the workshops was temporarily suspended until UMTA had established its final paratransit policy and implementation guidelines.

Office of Policy Research

Projects within this office embrace studies and analyses designed to provide data and concepts which will assist in the establishment of long-term goals and objectives for UMTA programs. The office also administers the University Research and Training Grant Program described in the following chapter.

Major research efforts in FY 78 were in the areas of urban revitalization, joint transit land use development, paratransit, and financing.

The Office of Policy Research developed several studies in the area of joint urban revitalization transit development. One of the studies, Improving Center City Environment and Transportation (DC-06-0163), focused on ways to improve the center city environment through a variety of transportation-related improvements, including:

- auto-restricted zones, parking restrictions, selective street closings, and bans on delivery trucks
- pedestrian streets, malls, skywalks, and underground concourses
- transit malls, downtown minibus service, and transit information
- moving sidewalks, people movers, and other mechanized systems to improve downtown circulation
- landscaping, use of outdoor art, benches, shelters, lighting, small parks, and other downtown beautification projects.

A related study, Casebook on Joint Development Practices (DC-06-0183), looked into experiences throughout North America on the multiple use of transit development land. This collection of case studies provides guidelines for public and private organizations contemplating joint development projects. Policy research efforts in the area of urban revitalization also included a project, Conference on Urban Revitalization (DC-06-0188), to permit an exchange between grass-roots organizations and practitioners in the area of urban revitalization. The emphasis of the conference focused on neighborhood conservation and revitalization efforts involving low-cost transportation projects. The conference also discussed assistance programs sponsored by other federal agencies.

Another project, Developing Intra-Neighborhood Transportation Systems (DC-06-0203), investigated the approaches and financial mechanisms necessary for the development of neighborhood-oriented transportation systems. The project was designed to help neighborhood organizations develop area transportation needs assessments, system designs, and to study the various self-help approaches to financing service.

Two projects were undertaken to improve the performance and lower the costs of light rail transit (LRT). One of the projects, Means for Reducing Light Rail Transit Cost Through Standardization of System Elements (IT-06-0103-03), investigated the possibilities and procedures for standardizing many of the components of LRT systems. Such components as power distribution

subsystems, signals and controls, at-grade intersections, switches, stations, and other elements which, if standardized, could be mass produced, would cost less, be more reliable, and require less maintenance.

The other LRT project, Study of Methods of Improving LRT Service (IT-06-0103-02), looked into methods of improving LRT service or reducing its cost. Specific areas of research in this study included a self-service fare collection system that could reduce trip time and manpower requirements, thereby permitting a more equitable fare structure; pre-emptive signals at intersections; pedestrian protective barriers; pedestrian malls; and various methods for improving vehicle flow.

A project entitled Study to Identify Relevant Criteria for Selection of Sites for Fixed Guideway Systems (NY-06-0061) sought to develop and evaluate possible criteria and methodologies to identify candidate cities or travel corridors which might be appropriate for fixed guideway transit systems. Such systems include rail rapid transit, light rail transit, and downtown people movers. The concepts developed in this project may be useful as adjuncts to UMTA's Alternatives Analysis requirement.

The Office of Policy Research, in FY 78, once again funded a number of ongoing transportation programs of the National Academy of Science Transportation Research Board (TRB) (DC-06-0216). The TRB program includes a wide range of specific research and information sharing activities.

The TRB publishes several newsletters to inform and encourage the transportation community to expand its interest in

research activities. Among its publications are *TRB News*, *Newsline*, *Paratransit News*, *Land Use and Transportation Newsletter*, and *Light Rail Transit Newsletter*.

In addition to its annual meeting, which serves as a national forum for the discussion of transportation issues, TRB sponsored 12 conference workshops on a wide range of transportation issues during the year.

TRB activities also included a study of transit marketing and user information aids, a review of Section 9 planning studies, and a survey of the impact of a Florida marketing demonstration.

A study of the energy used in the various modes of commuter transportation was undertaken in the Energy Policy Study (IT-06-0170). This study makes modal comparisons of per passenger energy consumption in support of the formulation of federal energy transportation policies.

Two projects investigating Transportation System Management (TSM) were developed by the policy research office. One of the projects, Analysis of the Application and Impact of Transportation System Management Techniques in Revitalizing Selected Urban Areas in Europe (FN-06-0003), was developed in the hope of learning from successful urban revitalization efforts in several European cities.

The other TSM project, TSM Institutional and Planning Research (VA-06-0047), was designed to document, from two different perspectives, the institutional arrangements found to be useful in planning TSM programs. The project also undertook to describe

successful TSM planning methods and to develop new information on the impacts of TSM actions, and strategies combining various actions.

A project, Communications Program: Urban Transportation Innovations Abroad (DC-06-0207), was developed to facilitate the exchange of information on international developments in transportation management and urban revitalization. The project consists of two main activities: the development of a newsletter on public transportation innovations abroad; and the development of a clearinghouse for the exchange of information on transportation, planning, and the environment.

The Office of Policy Development also conducted a study, Impacts of Foreign Rail Car Competition on the U.S. Economy and the Financial Health of Domestic Suppliers (DC-06-0213). The Study, while considering the implications that importing foreign rail cars would have on federal transit policy, also looked at the secondary impacts of balance of payments (trade deficits), unemployment ratios, and a host of other economic issues.

Finally, FY 78 policy research included a study, Electric Trolley Bus Feasibility Study (IT-06-0193), to provide a comprehensive report on the economics, technology and operation of the electric trolley bus. A report on the study will be written as a guide for transit decision-makers, planners and operators to assist them in evaluating the feasibility of the electric trolley bus. The study can also be used as a basis for comparisons with other modes in an alternatives analysis study.

Office of Program Evaluation

The Office of Program Evaluation is responsible for conducting and coordinating evaluation studies of UMTA programs and assessing the effectiveness of urban transportation performance. The office is developing new approaches, methods and measures for continuous monitoring of transit performance and for the evaluation of UMTA assistance programs.

During FY 78, the office completed several evaluation studies and other special reports on such topics as UMTA's rail modernization program, formula grants for capital and operating assistance, and cost estimates for providing accessible transit services to the elderly and handicapped. Other special studies assessed the use of transit performance systems by local governments, growth trends, transit operating cost components, comparisons of automobile costs in selected urban areas and other topical analyses.

Another major effort of the office was the continuation of two special travel survey programs. Developed in 1975, the Survey of Travel to Work (DC-06-0124, DC-06-0144, and DC-06-0189) was conducted by the Bureau of the Census as a supplement to the Annual Housing Survey. This survey of the nation's commuting patterns includes information on residential and workplace locations, current and prior mode of travel, time of departure, travel time and distance, satisfaction with travel mode, and other demographic and economic information. Results for the national and metropolitan

areas are available in tabular form and computer tape files.

The second survey, the National Personal Travel Survey (NTPS) (DC-06-0174) was also conducted by the Bureau of the Census for UMTA and the Federal Highway Administration (FHWA). The survey has collected a week-long trip diary and a detailed single-day travel log for each household member. The national sample of 20,000 households was surveyed every three months. Field work for the 1977 NTPS was completed in FY 78, and final results will become available in FY 79.

Policy and Program Development

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
OFFICE OF POLICY DEVELOPMENT					
The County Role in the Provision of Public Transportation in Non-Urbanized Areas	IT-06-0160	\$75,000	July 1976- Oct. 1977	National Association of Counties	Michael Steadham (202) 426-4058
Survey of Public Transportation Services in Small Urban Areas, 10,000-200,000 Population	DC-06-0155	\$55,000	July 1976- Dec. 1979	The Urban Institute	Douglas Birnie (202) 426-4060
Assessment of Conventional and Innovative Methods for Financing Public Transportation	IT-06-0127	\$90,000	Sept. 1976- June 1978	Institute of Public Administration; Gladstone Associates	Michael Steadham (202) 426-4058
An Assessment of the State Use of Section 9 Funds	DC-06-0132	\$35,859	Sept. 1976- Dec. 1977	National League of Cities; U.S. Conference of Mayors	Michael Steadham (202) 426-4058
Joint Development: A Value Capture Project	NY-06-0047	\$60,000	Sept. 1976- Dec. 1977	Administration and Management Research Associates (AMRA), Inc.	Green Miller (202) 426-4058
Conference on Joint Development and Multi-Agency Funding	DC-06-0214	\$80,838	Dec. 1977- Dec. 1978	Public Technology Inc.; Urban Land Institute	Sal Caruso (202) 426-4060
Liability and Casualty Insurance for Paratransit Providers	MD-06-0030	\$67,812	Feb. 1977- Sept. 1978	International Taxicab Association	James Stratton (202) 426-4060

Policy and Program Development

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
OFFICE OF POLICY DEVELOPMENT					
Paratransit Implementation Guidance and Reference	MD-06-0034	\$53,695	June 1977- Sept. 1978	International Taxicab Association	James Stratton (202) 426-4060
Support of Regional Workshops on Paratransit Implementation	DC-06-0210	\$62,000	Sept. 1977- Dec. 1980	The Urban Institute	Douglas Birnie (202) 426-4060
Impacts of Rural Transit Funding Options	IT-06-0159	\$48,000	Nov. 1976- Sept. 1977	Ecosometrics, Inc.	Douglas Gurin (202) 426-4060
OFFICE OF PROGRAM EVALUATION					
Survey of Travel to Work	DC-06-0124	\$1,195,000	June 1975- continuing	Bureau of the Census	Gary Ceccucci (202) 426-4060
	DC-06-0144	\$1,025,000			
	DC-06-0189	\$1,110,000			
National Personal Travel Survey	DC-06-0174	\$219,500	Jan. 1977- June 1978	Bureau of the Census	Gary Ceccucci (202) 426-4060
Paratransit Reporting System	IL-06-0035	\$95,000	Sept. 1976- July 1977	International Taxicab Association; Wells Research Co.; Control Data Corp.	Bryan Green (202) 426-4058
OFFICE OF POLICY RESEARCH					
Means for Reducing Light Rail Transit Cost Through Standardization of System Elements	IT-06-0103-03	\$55,000	Sept. 1976- Dec. 1979	DeLeuw Cather and Co.	James Yu (202) 426-0080
Study of Methods of Improving LRT Service	IT-06-0103-02	\$53,000	Sept. 1976- July 1979	DeLeuw Cather and Co.	James Yu (202) 426-0080

Policy and Program Development

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
OFFICE OF POLICY RESEARCH					
Energy Policy Study	IT-06-0170	\$142,000	June 1978- June 1979	System Design Concepts	Cindy Burbank (202) 426-4058
TSM Institutional and Planning Research	VA-06-0047	\$145,000	June 1976- June 1979	Alan M. Voorhees, Inc.	Richard Cohen (202) 426-4060
Analysis of the Application and Impact of TSM Techniques in Revitalizing Selected Urban Areas in Europe	FN-06-0003	\$16,968	Sept. 1977- June 1978	Ecoplan International	James Yu (202) 426-0080
National Academy of Science, Transportation Research Board (TRB)	DC-06-0216	\$460,000	Sept. 1978- Sept. 1979	Transportation Research Board	Judy Z. Meade (202) 426-0080
Conference on Urban Revitalization	DC-06-0188	\$93,063	April 1977- Jan. 1979	The Conservation Foundation	Richard Cohen (202) 426-4060
Improving Center City Environment and Transportation	DC-06-0163	\$55,000	Sept. 1976- Feb. 1978	Public Technology, Inc.	James Yu (202) 426-0080
Developing Intra-Neighborhood Transportation Systems	DC-06-0203	\$109,140	July 1977- May 1978	National Center for Urban Ethnic Affairs	Richard Cohen (202) 426-4060
Casebook on Joint Development Practices	DC-06-0138	\$85,000	Jan. 1977- July 1979	Urban Land Institute	James Yu (202) 426-0080
Study to Identify Relevant Criteria for Selection of Sites for Fixed Guideway Systems	NY-06-0061	\$60,000	Jan. 1977- Feb. 1978	Regional Plan Association, Inc.	James Yu (202) 426-0080

Policy and Program Development

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	AGENCY/ CONTRACTOR	TECHNICAL CONTACT
OFFICE OF POLICY RESEARCH					
Communications Program: Urban Trans- portation Innovations Abroad	DC-06-0207	\$50,000	Nov. 1977- Feb. 1979	Council for International Urban Liaison	Philip Hughes (202) 426-0080
Impacts of Foreign Rail Car Competition on the U.S. Economy and the Financial Health of Domestic Suppliers	DC-06-0213	\$40,000	Nov. 1977- Feb. 1978	Richard J. Barber Associates, Inc.	Philip Hughes (202) 426-4058
Electric Trolley Bus Feasibility Study	IT-06-0193	\$48,000	Aug. 1978- Sept. 1979	Chase, Rosen and Wallace, Inc.	Yvonne Griffin (202) 426-4060

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered through NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS may not have been published in sufficient

quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

POLICY RESEARCH

Improving Center City Environment and Transportation: Local Governments' Solutions

Proj. DC-06-0163
Public Technology, Inc.
February 1978

A Study of Minority Business Participation in the Urban Mass Transportation Industry

Proj. DC-06-0146
One America, Inc.
July 1977

- Vol. I, **Analysis of Minority Business Participation**, PB 274-773/AS
- Vol. II, **Developing Successful Minority Business Enterprise Programs for Public Transit Properties: A Manual**, PB 274-774/AS
- Vol. III, **Public Transit Contracting Opportunities for Minority Business Enterprises: A Manual**, PB 274-775/AS

Transit Station Area Joint Development: Strategies for Implementation

Proj. NY-06-0047

Administration and Management Research Association of New York City, Inc.
February 1976

Economic Case Studies, PB 268-104/AS
Final Report, PB 268-103/AS

Transportation System Management: A Bibliography of Technical Reports

Urban Mass Transportation Administration
May 1976, PB 256-273/AS

POLICY DEVELOPMENT

Final Report on the County Role in the Provision of Public Transportation in Non-Urbanized Areas

Proj. IT-06-0160

National Association of Counties, Research Foundation
October 1977

Taxis, The Public and Paratransit: A Coordination Primer

Proj. MD-06-0034

International Taxicab Association and Multisystems, Inc.
August 1978

Taxis and Paratransit: Publication Sources

Proj. MD-06-0034

International Taxicab Association
August 1978

A Study of Automobile Insurance Trends and Availability for the Taxicab Industry

Proj. MD-06-0030

International Taxicab Association and Arthur D. Little, Inc.
August 1978

An Analysis of Taxicab Company Insurance Coverage

Proj. MD-06-0030

International Taxicab Association
August 1978

Policy Toward Rail Transit

Department of Transportation
Urban Mass Transportation Administration
Federal Register
March 7, 1978

Light Rail Transit: State of the Art Review

Proj. IT-06-0103

DeLeuw Cather and Company
Spring 1976, PB 256-821/AS

Transportation System Management: State of the Art

Proj. RI-06-0008

INTERPLAN Corporation
September 1976, PB 266-953/AS

Center City Environment and Transportation: Local Government Solutions

Proj. DC-06-0163

December 1977

PROGRAM EVALUATION

Selected Characteristics of Travel to Work in 21 Metropolitan Areas: 1975

Proj. DC-06-0124, DC-06-0144

Bureau of the Census
Series P-23, No. 68
February 1978

Selected Characteristics of Travel to Work in 20 Metropolitan Areas: 1976

Proj. DC-06-0124, DC-06-0144

Bureau of the Census
Series P-23, No. 72
September 1978

Increasing Transit Ridership: The Experience of Seven Cities

Urban Mass Transportation Administration
November 1976, PB 271-071

Proceedings of the First National Conference on Transit Performance

Proj. DC-06-0184

Public Technology, Inc.
January 1978

Transit Operating Performance and the Impact of the Section 5 Program

Urban Mass Transportation Administration
November 1976

Automobile Costs in 61 Urbanized Areas

Urban Mass Transportation Administration
September 1978

The UMTA Rail Modernization Program

Urban Mass Transportation Administration
July 1978

Transit System Performance Indicators: An Assessment of Current U.S. Practices

Urban Mass Transportation Administration
October 1978

The Cost of Making Urban Rail Transit Accessible to the Handicapped

Urban Mass Transportation Administration
November 1978

Trends in Bus Transit Operations: 1960-1974

Control Data Corporation and Wells Research Co.
January 1977

University Research and Training Grant Program

Trends and Highlights



The University Research and Training Grant Program is designed to support and encourage university research and education projects which assist all levels of government in meeting their transportation needs. Projects funded under this program include research on the planning, design, construction, operation and evaluation of transportation systems, and training for working professionals.

The program promotes greater interaction between the academic community and local transportation authorities by encouraging universities to become sources of advice and information on transportation-related issues. Universities are also encouraged to develop programs to help practicing professionals stay abreast of current transportation programs and technologies.

This chapter on university research is divided into ten project areas. One of the areas, Transportation System Management, contains projects still unfinished and continued from FY 77. Two other areas, Transportation and Energy Conservation and Transportation for the Elderly and Handicapped, are new to the research program. There are seven other project areas in which studies were undertaken in FY 77 and again in FY 78.

Projects awarded grants in FY 78 and unfinished projects awarded grants in FY 77 are grouped and described in the appropriate project area. Each project is also listed in the accompanying chart.

Reports published from 1976 to 1978 as part of the University Research Program are listed at the end of the chapter.

Transportation Analysis, Planning, and Evaluation

Organizational Alternatives for Metropolitan Transportation Services (CA-11-0001)

Desirable conventional transit and paratransit improvements have been slow to develop because of regulatory restrictions which foster geographically defined, monopolistic and unresponsive transit operations. To help lower the barriers presented by these regulations, this project, as a continuation of research started in FY 77, will attempt to redesign the structure of present transportation organizations. Assisting in the reassessment of these organizations will be university groups, transit officers and public officials.

Los Angeles County Transportation Commission Public Policy Impact Study (CA-11-0002)

This project will continue an evaluation started in FY 77 of the Los Angeles County Transportation Commission's \$9.8 billion work program (\$4 billion of which is federal) and its impact on public policy. In order to document the effects which a program of this magnitude has on public policy, the study will investigate 13 individual categories that either affect or are affected by public policy. These categories include such diverse areas as socio-economic concerns, the environment, government objectives, activities and programs, citizen participation and political concerns.

Shared-Ride Taxi As Community Public Transportation (CA-11-0017)

This study will assess the shared-ride taxi's potential for playing a major role as a public transportation carrier in suburban or other low density communities. Research will be based upon an analysis of shared-ride taxi in California.

Predicting Citizen Acceptance of Transportation Improvements: Neighborhood Organization and Cohesion As Indicators (GA-11-0008)

To facilitate the ability of government to develop transportation improvement projects, this study will investigate the value of using various measures of both neighborhood cohesion and of local organizations as indicators for predicting response to planned transportation projects.

Development of a Handbook on Transportation Issues (IL-11-0025)

This project seeks to develop a resource manual of information for public affairs, media, and marketing personnel to use in the preparation of speeches, press releases, and brochures on urban transportation issues. The information will be packaged in a way that is expected to be interesting and understandable to the non-professional.

Integrating Project Worthiness into a Cost-Effectiveness Framework for Alternatives Analysis (IL-11-0026)

This project will construct a framework for the evaluation of competing alternatives analyses submitted by urban areas as part of an application for financial support for fixed-guideway transit projects. It is expected that the resulting evaluation

process can be used to promote an efficient and balanced allocation of federal resources.

The Development of a Transportation Needs Assessment Methodology for Neighborhood Preservation Areas (MD-11-0003)

This project is designed to assist neighborhood preservation groups in assessing the transportation needs of their areas. Developed from specific case studies and a wider range of neighborhood preservation projects, a technical manual of instructions, information sources and guidelines will be produced to provide a resource for community use.

Long Range Directions for Urban Public Transportation: A Study in Context (NY-11-0017)

This project will attempt to develop plausible alternatives describing the future structure of society. The transportation implications of each alternative will be described and supportive public policy actions will be postulated. In turn, a case study book for decision-makers, outlining the various alternatives, implications, and consistent actions, will be developed.

An Investigation of the Influence of Knowledge and Information on Mass Transit Utilization (VA-11-0008)

This study will determine the extent to which education and information about mass transit services increases the use of mass transit. The results of the study will be used to develop an effective educational model which will provide information and promote the benefits of mass transit use to potential riders.

Visualizing Congestion Patterns: A Policy-Oriented Feasibility Assessment (WA-11-0002)

This study will investigate ways in which data can be collected and displayed accurately and cost-effectively to show how urban street congestion develops and diffuses. The results of the study will provide a basis for further work in the area of traffic congestion data display and in subsequent congestion policy studies.

Shopping Center Travel on Transit: A Review and Evaluation of Recent Experience in the United States (WA-11-0006)

This research seeks to develop policy options that UMTA could pursue to encourage the use of transit for shopping trips. Research conducted in this project will include review and analysis of 20 to 30 case studies of the experiences of shopping center and transit system operators who have provided transit service for shopping center patrons. The resulting information could be useful to transit system and shopping center operators who wish to design and implement transit services for shoppers.

Feasibility of a Complementary Solution to the Bus Operator Scheduling Problem (WV-11-0001)

This project will investigate the feasibility of developing a computerized system to complement the RUNS portion of UMTA's Run Cutting and Schedule (RUCUS) computer software package. If actually developed, this system would complement and refine the present ability of transit management to effectively schedule both drivers and vehicles.

Transportation and Land Use Interactions

Transportation in Urban Development and Revitalization (MA-11-0033)

This study will investigate the interrelationship between transportation projects and urban development/revitalization projects. Specific areas covered will include: the influence of federal transportation programs in encouraging urban development; the role of transportation investment in state and city urban development policies; the results of case studies on urban transportation-urban revitalization in Massachusetts and Michigan; and the various options available to the DOT in encouraging a closer relationship between urban transportation and urban revitalization.

An Analysis of Joint Development Projects (NY-11-0020)

This project seeks to develop a set of indicators that could be used to predict changes in the economic conditions of a central business district (CBD), based upon specific urban transportation-urban revitalization projects. The project also will attempt to determine the combination of transit service accessibility and downtown activity that will provide the greatest stimulus for CBD development.

Joint Development and Value Capture Research (TX-11-0006)

This project will assist selected cities in using transit development to bring about large community development efforts. The project will attempt to foster energy efficient land use, to preserve and revitalize

central cities, and to achieve tangible financial gains by optimizing federal and local funds and encouraging private investment capital.

The Feasibility of Joint Development in Selected Transit Station Locations in the Detroit Area (MI-11-0003)

This fact-finding study will attempt to evaluate the potential for joint development planning in the Detroit area. The study will consider physical and administrative planning undertaken at five station locations along proposed transit corridors. The results of the study will be compiled as a set of guidelines which may be followed in similar studies in Detroit or in other cities.

Transportation System Management [TSM]

Area Responses to Transportation System Management (TSM) Requirements (MA-11-0008)

This study will investigate issues which have proven to be critical components in the development of the TSM program. These issues include the role of transportation agencies within an integrated group of agencies and the process of TSM development. Each issue and its sub-areas will be analyzed and evaluated as to its potential impact on the eventual success of the TSM program.

The Development of an Evaluation Framework for Transportation System Management Strategies (NE-11-0001)

This project will develop a framework for evaluating TSM strategies by using a

set of performance measures related to TSM objectives. Although this research will be done in the Omaha Council Bluffs area, the methodology will be structured so that it may be used in other areas as well.

Planning and Design Guidelines for Transportation System Management (PA-11-0016)

Based upon specific objectives relating to particular areas, corridors, or facilities, this project will develop guidelines for TSM planning; establish the basic principles for application of technical, pricing, or regulatory measures; present a number of new technical solutions; and devise a systematic index of the references for the existing solutions found in the literature. In addition, while emphasizing transit system productivity and efficiency, the project will develop an evaluation procedure for TSM projects.

Improving Transportation in Center Cities

Evaluating Radial Corridor Auto Restraint and Transit Priority Measures (MA-11-0031)

This study will focus on a detailed evaluation of various auto restraint and transit priority schemes in one or two specific radial corridors in Boston. The study will also investigate the political and institutional factors that affect the feasibility of implementing restraint and priority measures.

Public Transportation Systems and Service for Low Density Areas

Monitoring the Implementation of Innovative Public Transportation Services (IL-11-0012)

The research conducted in this study will be carried out by monitoring, documenting and evaluating the implementation of two innovative public transportation systems in Illinois. One system is a combination of subscription and dial-a-ride services. The other system is a combination of fixed-route feeder, subscription, and route-deviation services.

Integrated Paratransit Transportation Planning for Low Travel Densities (IL-11-0023)

This project will have two products. The first is a planning manual for an integrated public transportation program in low-density areas. The manual will present modern strategies for implementing and marketing paratransit services. The second product will be a computer-based method of estimating ridership and identifying the most inexpensive way of meeting travel needs.

Development of Integrated Transit Services for a Rural-Suburban County (VA-11-0006)

This project will research and design a transportation program for a rural Virginia county. Various paratransit concepts will be developed including the use of a broker to provide paratransit services, an arrangement for the city to provide transit services to urbanized parts of the county,

and a plan to integrate paratransit services in the county with conventional transit services in the city.

An Examination of the Factors Influencing the Level of Success of Non-CBD Oriented Transit Lines Operating in Low Density Areas of Metropolitan Regions (PA-11-0018)

This project will attempt to develop a better understanding of the conditions and relationships that foster success in establishing, maintaining or expanding transit lines in low density neighborhoods or small communities outside the CBD. The regions to be studied include Philadelphia, San Diego and Toronto.

Development of Integrated Transit Services for a Rural-Suburban County (VA-11-0009)

This project addresses the requirements of implementing transit services that have been approved by community consensus in low density areas. The project will establish a decision-making process, an organizational and management plan for implementing services, a financial plan, and will review institutional, regulatory and labor issues.

Transit Productivity and Efficiency

The Cost of Work Rules (CA-11-0018)

This project will make a systematic comparison and analysis of the relative costs of a variety of work rules for bus drivers in each of a selected sample of transit properties in California. The study will also examine the costs and benefits of

peak hour ridership in relation to transit management.

Management Performance Audit Guidelines (IN-11-0004)

This project will develop a handbook of guidelines for conducting an audit of transit management performance. The guidelines will be intended to help improve transit services and to increase accountability to the public. The handbook will describe an audit methodology emphasizing new techniques to bring problems to the surface where they can be treated.

Improving the Productivity of the Urban Transportation Systems (NY-11-0019)

This project will identify urban mass transportation productivity problems, design possible solutions, and document these solutions and strategies in a handbook designed for public distribution.

A Comprehensive Analysis of Transit Efficiency and Productivity (IN-11-0003)

This study will develop a uniform set of indicators that could be used in analyzing the efficiency and productivity of transit operations. The indicators will be established after reviewing and testing through sensitivity analyses all concepts and definitions presently in use.

Measuring the Influence of Subsidies on Transit Productivity and Efficiency (NE-11-0002)

This project will analyze data from several transit systems to test hypothetical relationships between the amount, type, source, and certainty of operating

subsidies with productivity and efficiency.

Increasing Efficiency in Bus Maintenance Operations (PR-11-0002)

This study will formulate standard measures of productivity in bus maintenance operations that will allow management to allocate both manpower and money more effectively.

Effect of Organization Size on Transit Productivity and Employee Satisfaction (CA-11-0016)

This study will investigate the correlation between the size of transit properties and employee satisfaction, based on such measures as job performance, job satisfaction, absenteeism and turnover rates. Selected transit organizations in California, representing a range of sizes and structures, will be examined in this study.

Study of Social Service Agencies Operating Transit Systems for Low Income Elderly and Handicapped to Improve Efficiency and Productivity (TX-11-0008)

This project will develop techniques to improve the productivity and efficiency of two demand-responsive transit systems. The systems are run by two social service agencies to serve the elderly and handicapped in four rural counties in Texas.

Development of Methodologies for the Evaluation of Bus Route Performance Through the Application of Transit Performance Indicators (UT-11-0001)

This project will develop an approach for transit planners and operators to use in

applying performance indicators to determine whether changes should be made to improve efficiency and productivity in a transit system. The project will use applied statistics in its approach to problem solving.

Union-Management Programs in Urban Transit (WI-11-0006)

This project will provide a forum for transit union and management representatives to discuss problems in labor relations and procedures for solving these problems. Discussions will focus on identifying problems in which both labor and management are willing to work together. In addition, program options will be developed to guide UMTA in its attempt to help labor and management resolve their conflicts.

Transportation and Energy Conservation

Urban Transportation Energy Accounts, Analysis and Methods (IL-11-0027)

A study of the Chicago region will be developed to analyze the relationship of energy consumption to various combinations of transportation services and land use patterns. In one corridor of the region, the factors will be studied in detail. The study will also develop a manual of procedures for analyzing energy use, transportation services, and land use relationships.

What Are the Total Energy Advantages of Public Transportation? (NY-11-0021)

This project will investigate the total energy effects of public transportation including direct energy consumption, the total energy burden, energy expenditure in non-transportation sectors due to the influences transportation has had on land use, and other factors. The study will also document the energy conservation advantages of public transportation.

Transportation for the Elderly and Handicapped

Negotiating the Subway by the Elderly and Handicapped, Metro: A Case Study (DC-11-0006)

This project will attempt to determine whether adherence to the American National Standards Institute (ANSI) regulations is sufficient to guarantee accessibility of the Washington, D.C. Metro to the elderly and handicapped.

Development of Cost-Effectiveness Measures and a Planning Methodology for Transportation Services for the Elderly and Handicapped (TX-11-0009)

This project will develop data and a methodology to help identify the costs and benefits of transportation services offered to the elderly and handicapped by a number of different providers under various service arrangements. The project will also assist in determining the most cost-effective providers in given local situations.

Transportation Pricing and Financing

An Examination and Evaluation of Selected Funding Issues in Urban Mass Transportation (MA-11-0030)

This study will include eight to ten case studies of the ways in which transit fiscal issues have evolved in urban areas. The study reviews the various funding sources available in one of the areas to support special transportation services and subsidies. In addition, the study will examine the effects federal and state assistance and subsidies have had on the decisions and policies of three representative urban transportation agencies. Finally, analyses will be prepared of potential revisions in federal and state transit assistance policies.

Evaluation of Ridership, Revenue, and Equity Implications of Distance-Based Fares for Transit Systems in Medium Sized Urban Regions (NY-11-0016)

This project will develop a computer simulation model and supporting software to analyze the impact of distance-based fare schedules on revenue, ridership and rider profiles. These tools will embody one or more mathematical models to relate ridership and revenue to a given fare structure and population demographics. The model will be applicable to many metropolitan areas.

Local Transportation Finance: Cost Sharing Arrangements of Towns and Cities (NC-11-0008)

This project will investigate the problems found in joint financing of public transportation services. Research will

include an inventory of arrangements used to apportion local financial responsibility for public transportation in multi-jurisdictional systems, ten case studies of joint financial responsibility for public transportation and an alternative assessment and review of policy implications of the study.

Self-Sustaining Public Transportation Services: Analysis and Guidelines for Implementation (PA-11-0017)

This project will develop a handbook identifying the common characteristics of self-supporting, line-haul public transportation service. In comparing the services offered profitably by bus in New York and by commuter rail in Philadelphia and Chicago, this study will investigate the markets served, the services offered, and the cost of each service. Criteria will be developed which will identify other areas where such self-supporting services could be put into operation.

Evaluation of the Impacts of Federal Transportation Programs in Small Urban Areas (IA-11-0001)

This study will evaluate urban transportation financing with particular attention given to federal transportation programs. Using case studies of three cities in Iowa, an analysis will be made of the impacts of financing procedures and constraints on transportation systems. The effect of federal programs on state urban transportation investments, and the effect these investments have on subsequent federal and state investment decisions in smaller urban areas, will also be considered.

Transportation Education and Training

Administrative Experiences and Innovations in Urban Mass Transportation Systems (GA-11-0006)

This project will develop 12 to 16 case studies illustrating significant administrative experiences and innovations involved in the development of the Metropolitan Atlanta Rapid Transit Authority. The studies will focus on management processes and operational innovations, critical incidents in program development, and political and technical interactions.

A Training Program for Minorities in Transportation Engineering (GA-11-0009)

This grant will provide continued support for training minorities and women in the field of transportation engineering. The program will also help to develop and expand a program of student internships in urban transportation projects.

Student Intern Training and Research Program (HI-11-0002)

This grant will provide support to students of urban transportation by allowing them to gain practical working experience in an urban transportation-oriented agency. The program is intended to provide a vehicle for minority students to enter the transportation profession.

Workshop on Interactive Applications of UMTA/FHWA Planning Tools for the Analysis of Policy Issues (NJ-11-0007)

This project will develop a one-week workshop in advanced uses of the Urban

Transportation Planning System (UTPS). The workshop will be designed to assist local and state planners in the use of UTPS computerized and manual procedures to analyze TSM options and long-range alternatives for their areas. The goal of the program is to train planners to make technical analysis more responsive to policy alternatives and more sensitive to the informational needs of decision-makers.

Dissemination of the Transportation Brokerage Concept (TN-11-0002)

This project provides an intensive training program for transportation professionals and academicians in the brokerage concept of providing transportation services. The program will consist of one four-week training session.

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
TRANSPORTATION ANALYSIS, PLANNING, AND EVALUATION					
Organizational Alternatives for Metropolitan Services	CA-11-0001	\$141,366	June 1977-June 1979	U. of California, Berkeley Prof. M. Webber Prof. M. Landau	Bert Arrillaga (202) 426-4984
Los Angeles County Transportation Commission Public Policy Impact Study	CA-11-0002	\$149,064	June 1977-Aug. 1979	California State U., Long Beach Prof. P. Shaw	Cindy Burbank (202) 426-0080
Shared-Ride Taxi as Community Public Transportation	CA-11-0017	\$56,445	Sept. 1978-Aug. 1979	U. of California, Irvine Prof. G. J. Fielding	Doug Birnie (202) 426-4060
Predicting Citizen Acceptance of Transportation Improvements: Neighborhood Organization and Cohesion as Indicators	GA-11-0008	\$61,857	July 1978-June 1979	Clark College Prof. L. Earvin Prof. N. Jackson	Arthur Politano (202) 426-0281
Development of a Handbook on Transportation Issues	IL-11-0025	\$69,444	Aug. 1978-Aug. 1979	U. of Illinois, Chicago Circle Dean A. Voorhees C. Johnson	Yvonne Griffin (202) 426-4060
Integrating Project Worthiness Into a Cost-Effectiveness Framework for Alternatives Analysis	IL-11-0026	\$58,966	Oct. 1978-Sept. 1979	Northwestern U. Prof. J. Schofer Prof. M. Turnquist	Sal Caruso (202) 426-4060

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
The Development of a Transportation Needs Assessment Methodology for Neighborhood Preservation Areas	MD-11-0003	\$76,496	June 1977-June 1978	U. of Maryland Prof. R. Bish Prof. T. Molinazzi	Richard Cohen (202) 426-4060
Long Range Directions for Urban Public Transportation: A Study In Context	NY-11-0017	\$62,602	June 1977-Aug. 1978	Polytechnic Institute of New York Prof. L. Pignataro Prof. A. Weiner	Jimmy Yu (202) 426-0080
An Investigation of the Influence of Knowledge and Information on Mass Transit Utilization	VA-11-0008	\$67,492	July 1977-July 1978	Virginia Union College J. Gunnell J. Sharpe	Ron Mason (202) 426-2285
Visualizing Congestion Patterns: A Policy-Oriented Feasibility Assessment	WA-11-0002	\$26,353	June 1977-June 1978	U. of Washington Prof. J. Schneider	Granville Paules (202) 426-9271
Shopping Center Travel on Transit: A Review and Evaluation of Recent Experience in the U.S.	WA-11-0006	\$60,381	July 1978-June 1979	U. of Washington Prof. J. Schneider	Marvin Futrell (202) 426-4984
Feasibility of a Complementary Solution to the Bus Operator Scheduling Problem	WV-11-0001	\$61,738	July 1978-Sept. 1979	West Virginia U. Prof. R. Ward	A.B. Hallman (202) 426-9157

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
TRANSPORTATION AND LAND USE INTERACTIONS					
Transportation in Urban Development and Revitalization	MA-11-0033	\$98,466	Sept. 1978-Aug. 1979	Massachusetts Institute of Technology Prof. R. Gakenheimer Prof. D. Roos	Jimmy Yu (202) 426-0080
An Analysis of Joint Development Projects	NY-11-0020	\$56,295	June 1978-May 1979	State U. of New York, Buffalo Prof. R. Paaswell	Richard Steinmann (202) 426-2360
Joint Development and Value Capture Research	TX-11-0006	\$399,995	June 1976-June 1979	Rice Center for Community Design and Research Carl Sharpe, Director	Green Miller (202) 426-4060
Feasibility of Joint Development in Selected Transit Station Locations in the Detroit Area	MI-11-0003	\$57,799	June 1977-Aug. 1978	Wayne State U. Prof. S. Khasnabis	Green Miller (202) 426-4060
TRANSPORTATION SYSTEM MANAGEMENT [TSM]					
Area Responses to Transportation System Management (TSM) Requirements	MA-11-0008	\$74,175	June 1977-Oct. 1978	Massachusetts Institute of Technology Prof. R. Gakenheimer Prof. D. Roos	Richard Cohen (202) 426-4060
The Development of an Evaluation Framework for Transportation System Management Strategies	NE-11-0001	\$57,315	June 1977-Aug. 1978	U. of Nebraska, Lincoln Prof. P. Lima	Richard Cohen (202) 426-4060

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
TRANSPORTATION SYSTEM MANAGEMENT [TSM]					
Planning and Design Guidelines for Transportation System Management (TSM)	PA-11-0016	\$78,855	June 1977-Aug. 1978	U. of Pennsylvania Prof. V. Vuchic	Richard Cohen (202) 426-4060
IMPROVING TRANSPORTATION IN CENTER CITIES					
Evaluating Radial Corridor Auto Restraint and Transit Priority Measures	MA-11-0031	\$89,910	June 1977-Sept. 1978	Harvard U. Prof. J. Gomez-Ibanez	Bert Arrillaga (202) 426-4984
PUBLIC TRANSPORTATION SYSTEMS AND SERVICES FOR LOW DENSITY AREAS					
Monitoring the Implementation of Innovative Public Transportation Services	IL-11-0012	\$89,994	Sept. 1977-Oct. 1978	Northwestern U. Prof. J. Hauser Prof. F. Koppelman	Jim Bautz (202) 426-4984
Integrated Paratransit Transportation Planning for Low Travel Densities	IL-11-0023	\$75,882	June 1977-Aug. 1978	U. of Illinois, Chicago Circle Prof. A. Sen C. Johnson	Ruth Scott (202) 426-4060
Development of Integrated Transit Services for a Rural-Suburban County	VA-11-0006	\$79,109	June 1977-Aug. 1978	U. of Virginia Prof. L. Hoel Prof. M. Demetsky	Michael Steadham (202) 426-4060

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
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PUBLIC TRANSPORTATION SYSTEMS AND SERVICES FOR LOW DENSITY AREAS

An Examination of the Factors Influencing the Level of Success of Non-CBD Oriented Transit Lines Operating In Low Density Areas of Metropolitan Regions	PA-11-0018	\$60,933	July 1978- June 1979	U. of Pennsylvania Prof. A. Tomazinis	Douglas Gurin (202) 426-4060
Development of Integrated Transit Services for a Rural-Suburban County	VA-11-0009	\$74,618	July 1978- June 1979	U. of Virginia Prof. L. Hoel Prof. M. Demetsky	Douglas Gurin (202) 426-4060

TRANSIT PRODUCTIVITY AND EFFICIENCY

The Cost of Work Rules	CA-11-0018	\$78,575	July 1978- Sept. 1979	U. of California, Irvine Prof. C. Lave	Jim Stratton (202) 426-4060
Management Performance Audit Guidelines	IN-11-0004	\$68,046	Sept. 1978- Aug. 1979	Indiana U. Prof. George Smerk	A. B. Hallman (202) 426-9157
Improving the Productivity of the Urban Transportation System	NY-11-0019	\$49,276	July 1977- July 1978	John Jay College of Criminal Justice, Center for Productive Public Management M. Holzer, Director	N. C. Jasper (202) 426-0081
A Comprehensive Analysis of Transit Efficiency and Productivity	IN-11-0003	\$68,842	June 1977- Aug. 1978	Purdue U. Prof. K. Sinha	Gary Ceccucci (202) 426-4060

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
TRANSIT PRODUCTIVITY AND EFFICIENCY					
Measuring the Influence of Subsidies on Transit Productivity and Efficiency	NE-11-0002	\$40,960	Aug. 1977-Sept. 1978	U. of Nebraska, Omaha Prof. J. Gleason	Cindy Burbank (202) 426-0080
Increasing Efficiency in Bus Maintenance Operations	PR-11-0002	\$69,014	June 1977-Sept. 1978	U. of Puerto Rico Prof. L. Martin-Vega	Bryan Green (202) 426-4060
Effect of Organizational Size on Transit Productivity and Employee Satisfaction	CA-11-0016	\$61,234	July 1977-Sept. 1978	U. of California, Irvine Institute of Transportation Studies G. Fielding, Director	Fred Williams (202) 426-4060
Study of Social Service Agencies Operating Transit Systems for Low Income Elderly and Handicapped to Improve Efficiency and Productivity	TX-11-0008	\$51,800	June 1978-May 1979	Prairie View A&M U. H. Bonner M. Hawkins	Pat Cass (202) 426-4984
Development of Methodologies for the Evaluation of Bus Route Performance through the Application of Transit Performance Indicators	UT-11-0001	\$55,073	Oct. 1978-Sept. 1979	U. of Utah Prof. T. Stone	Brian Cudahy (202) 426-9274

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
TRANSIT PRODUCTIVITY AND EFFICIENCY					
Union/Management Programs in Urban Transit	WI-11-0006	\$73,815	June 1978-Aug. 1979	U. of Wisconsin, Madison Prof. J. Stern Prof. S. Rubinfeld	Frank Enty (202) 426-9274
TRANSPORTATION AND ENERGY CONSERVATION					
Urban Transportation Energy Accounts, Analysis and Methods	IL-11-0027	\$79,425	July 1978-June 1979	U. of Illinois, Urbana-Champaign Prof. D. Boyce Prof. M. Romanos	Cindy Burbank (202) 426-0080
What Are the Total Energy Advantages of Public Transportation?	NY-11-0021	\$70,494	Oct. 1978-Sept. 1979	Polytechnic Institute of New York Prof. W. McShane	Cindy Burbank (202) 426-0080
TRANSPORTATION FOR THE ELDERLY AND HANDICAPPED					
Negotiating the Subway by the Elderly and Handicapped, Metro: A Case Study	DC-11-0006	\$74,824	July 1978-June 1979	Howard U. Prof. D. Coleman E. White	Nat Jasper (202) 426-0081
Development of Cost-Effectiveness Measures and a Planning Methodology for Transportation Services for the Elderly and Handicapped	TX-11-0009	\$68,671	Sept. 1978-Aug. 1979	U. of Texas, Austin Prof. S. Rosenbloom	Jack Bennett (202) 426-4060
TRANSPORTATION PRICING AND FINANCING					
An Examination and Evaluation of Selected Funding Issues in Urban Mass Transportation	MA-11-0030	\$51,783	June 1977-Oct. 1978	Massachusetts Institute of Technology Prof. D. Roos	Jimmy Yu (202) 426-0080

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
TRANSPORTATION PRICING AND FINANCING					
Evaluation of Rider-ship, Revenue, and Equity Implications of Distance-Based Fares for Transit Systems in Medium-Sized Urban Regions	NY-11-0016	\$49,099	June 1977-Aug. 1978	State U. of New York, Albany Prof. L. Mohan Prof. D. Ballou	Bert Arrillaga (202) 426-4984
Local Transportation Finance: Cost Sharing Arrangements of Towns and Cities	NC-11-0008	\$70,000	July 1978-June 1979	North Carolina A&T State U. Prof. A. Kidder	Cindy Burbank (202) 426-0080
Self-Sustaining Public Transportation Services: Analysis and Guidelines for Implementation	PA-11-0017	\$70,000	July 1978-June 1979	U. of Pennsylvania Prof. E. Morlok Prof. P. Vinton	John Carulo (215) 597-4179
Evaluation of the Impacts of Federal Transportation Programs in Small Urban Areas.	IA-11-0001	\$73,347	June 1977-Aug. 1978	U. of Iowa, Institute of Urban Research K. Dueker, Director	Douglas Gurin (202) 426-4060
TRANSPORTATION EDUCATION AND TRAINING					
Administrative Experience and Innovations in Urban Mass Transportation Systems	GA-11-0006	\$74,751	June 1977-June 1978	U. of Georgia Prof. R. Golembiewski	Philip Hughes (202) 426-0080

University Research and Training Grant Program

PROJECT TITLE	NUMBER	FUNDING	SCHEDULE	GRANTEE	TECHNICAL CONTACT
TRANSPORTATION EDUCATION AND TRAINING					
A Training Program for Minorities in Transportation Engineering	GA-11-0009	\$67,170	Sept. 1978-Aug. 1979	Atlanta U. Center C. Espy, Director	Judy Meade (202) 426-0082
Student Intern Training and Research Program	HI-11-0002	\$55,878	Sept. 1978-Aug. 1979	U. of Hawaii Prof. C. Papacostas	Philip Hughes (202) 426-0080
Workshop on Interactive Applications of UMTA/FHWA Planning Tools for the Analysis of Policy Issues	NJ-11-0007	\$76,972	Aug. 1978-July 1979	Princeton U. Prof. J. Lutin Prof. A. Kornhauser	Robert Dial (202) 426-9271
Dissemination of the Transportation Brokerage Concept	TN-11-0002	\$90,036	May 1978-March 1979	U. of Tennessee, Transportation Center K. Heathington, Director	Jim Bautz (202) 426-4984

Bibliography

This list of reports contains those published from January 1976 to the present. For each report, a National Technical Information Service (NTIS) document number, if available, is listed following the publication date. Reports may be ordered though NTIS by using the order blanks provided at the back of this document.

Reports not available through NTIS

may not have been published in sufficient quantity for general distribution. However, they may be obtained by writing to the person listed as the technical contact in the project summary chart.

Finally, additional reports relating to the research in this chapter will become available during the upcoming year. For information on these reports and for suggestions on additional reference materials, call or write to the technical contact associated with each project.

UMTA University Research and Training Program Abstracts

Proj. UPP-30
Urban Mass Transportation Administration
February 1978, PB 278-646/AS

TRANSIT MANAGEMENT, PRODUCTIVITY, AND EFFICIENCY

Bus Actuated Signal Preemption Systems: A Planning Methodology

Proj. WI-11-0003
University of Wisconsin, Milwaukee
May 1976, PB 265-797

Improving Urban Mass Transportation Productivity

Proj. MA-11-0026
Harvard University
February 1977, PB 266-920

Design for a National Urban Transportation Reporting System

Proj. PA-11-0002
University of Pennsylvania 1976,
PB 259-002

The Role of Security in Marketing Urban Mass Transportation

Proj. IL-11-0008
University of Illinois, Chicago Circle
February 1977, PB 271-224

Factors Influencing the Adoption of Management Innovation in the CTA

Proj. WI-11-0002
Marquette University
July 1976, PB 226-154

Development of Performance Indicators for Transit: Final Report

Proj. CA-11-0014
University of California
December 1977, PB 278-678

Transit Performance Measures: Their Significance in Local Funding Allocation

Proj. WA-11-0005
University of Washington
June 1977, PB 276-141

Transit Authority Boards of Directors: Membership, Organization, Functions, and Performance

Proj. PA-11-0010
Pennsylvania State University
October 1976, PB 265-744

The Effects of Labor Strikes on Bus Transit Use

Proj. IN-11-0003
Purdue University
December 1976, PB 267-077

Labor Relations in Urban Transit

Proj. WI-11-0004
University of Wisconsin, Madison
August 1977, PB 274-059

The Legal Framework for Collective Bargaining in the Urban Transit Industry

Proj. WI-11-0004
University of Wisconsin, Madison
November 1976, PB 266-110

TRANSPORTATION FOR THE ELDERLY AND HANDICAPPED

Assuming Responsibility for Mobility of Elderly and Handicapped: The Role of Transit Properties, Transit Planners, and Social Service Agencies in Small Cities.

Proj. NC-11-0004
North Carolina A&T State University
July 1976, PB 267-231

TRANSPORTATION AND LAND USE INTERACTIONS

Potential for Betterment District Financing and Joint Development Applications to Surface Transit

Proj. WA-11-0005
University of Washington, Seattle
July 1977, PB 274-618/AS

TRANSPORTATION PRICING AND FINANCING

Estimation of the Operating Cost of Mass Transit Systems

Proj. NY-11-0012
State University of New York, Stony Brook
September 1976, PB 262-729/TBS

Sources of Non-Federal Support for Public Transportation Programs in Non-Urbanized Areas

Proj. NC-11-0004
North Carolina A&T State University,
Greensboro
June 1978, PB 284-410

Monetization of Transportation Impacts: Policy Evaluation Methodology

Proj. IL-11-0008
University of Illinois, Chicago Circle
April 1978, PB 284-585

IMPROVING TRANSPORTATION IN CENTER CITIES

Transit's Role in the Creation of the Polycentric City: An Initial Assessment

Proj. WA-11-0005
University of Washington
August 1977, PB 275-043

Urban Corridor Trip Distribution Models: A Study of the Chicago Area Using the Census UTPP Data

Proj. IL-11-0008
University of Illinois, Chicago Circle
September 1977, PB 275-161

Factors Influencing the Success of Company-Based Carpooling Programs

Proj. NC-11-0004
North Carolina A&T State University
May 1976, PB 259-434

Taxicab Characteristics in Small and Medium-Size Cities

Proj. NC-11-0003
University of North Carolina, Chapel Hill
January 1976, PB 251-984

Vanpools for Urban Transportation — Their Legislative Base, Promotion and Potential

Proj. WA-11-0005
University of Washington, Seattle
June 1977, PB 279-590

Urban Design and Usage Factors of Paratransit Vehicles and Facilities

Proj. NY-11-0011
Pratt Institute
April 1976, PB 255-541

URBAN TRANSPORTATION TECHNOLOGIES

Vehicle Follower Longitudinal Control for Automated Guideway Transit

Proj. MN-11-0002
University of Minnesota
February 1977, PB 264-554/TBS

Analysis and Design of Steering Controllers for Automated Guideway Transit Vehicles

Proj. MA-11-0023

Massachusetts Institute of Technology
September 1976, PB 261-327

Analytical Models for Guideway Surface Irregularities and Terrain Smoothing

Proj. TX-11-0001

University of Texas, Arlington
January 1976, PB 256-847

TRANSPORTATION ANALYSIS, PLANNING, AND EVALUATION

The Census and Transportation Planning: Survey of Evaluations and Recommendations as to the Usefulness of 1970 Census Data in Urban Transportation Planning

Proj. VA-11-0003

Virginia Polytechnic Institute and State University
January 1976, PB 254-802

Accessibility Applications in Urban Transportation

Proj. VA-11-0002

Virginia Polytechnic Institute and State University
January 1977, PB 269-240

User Documentation for the Metropolitan Accessibility Program

Proj. VA-11-0002

Virginia Polytechnic Institute and State University
January 1977, PB 269-239

The Significance of Telecommunications as a Partial Substitute for Transportation

Proj. PA-11-0013

Carnegie-Mellon University
September 1976, PB 284-718/AS

Advanced Dial-A-Ride Algorithms Research Project

Proj. MA-11-0024

Massachusetts Institute of Technology
March 1976, PB 254-752

A Computerized Bus Transit Management Information System Using Credit Card Fare Collection Information

Proj. NY-11-0001

Rensselaer Polytechnic Institute
April 1976, PB 255-982

A Modal Split Model for High Density Urban Corridors

Proj. IL-11-0008

University of Illinois, Chicago Circle
March 1978, PB 284-745

Elementary Analysis — Manual Methods Trip Distribution Modeling

Proj. IL-11-0008

University of Illinois, Chicago Circle
March 1978, PB 285-179/AS

Market Segmentation Analysis: The Potentials of Cartographic Analysis and Census Data

Proj. IL-11-0008

University of Illinois, Chicago Circle
March 1978, PB 285-056

Methodology for Identifying Urban Transportation Technology Alternatives

Proj. IL-11-0008

University of Illinois, Chicago Circle
March 1977, PB 271-225

Preliminary Systems Design for a Multi-Purpose Transit Planning and Management Information System

Proj. WA-11-0005

University of Washington
March 1976, PB 255-178

An Interactive Spatial Analysis and Display System

Proj. WA-11-0005

University of Washington, Seattle
July 1977, PB 280-693

Utilizing Geographic Basefiles for Transportation Analysis: A Network Basefile System

Proj. WA-11-0005

University of Washington
June 1977, PB 275-586/AS

Employer Vanpool Programs: Factors in Their Success or Failure

Proj. WA-11-0005

University of Washington
June 1977, PB 276-955

Urban Freight Consolidation: Legal, Attitudinal, and Operational Considerations Associated with Implementation

Proj. OH-11-0001

Ohio State University, Columbus
May 1978, PB 286-547

The Location and Sizing of Urban Freight Terminals with Multiple Planning Periods: The Urban Terminal Investment Model [UTIM]

Proj. OH-11-0001

Ohio State University, Columbus
December 1977, PB 286-490

A Methodology for Determining Characteristics of Small Shipments

Proj. OH-11-0001

Ohio State University, Columbus
July 1976, PB 279-649

Management of Vehicular Traffic Facilities for Better Transit Movement: Some Aspects

Proj. NY-11-0009

Polytechnic Institute of New York
December 1976, PB 267-942

RAM: A Normative Tool for Transit Route Planning

Proj. NY-11-0009

Polytechnic Institute of New York
September 1977, PB 275-213

Taxicab Utilization by Lower Income Groups

Proj. NC-11-0004

North Carolina A&T State University
October 1976, PB 269-581

Establishing Innovative Taxicab Services: A Guidebook

Proj. NC-11-0005

University of North Carolina
August 1977, PB 278-647

Appendices

APPENDIX A

Sources of UMTA RD&D Information

National Technical Information Service

Reports on UMTA research and development described in this volume are available to the public through the National Technical Information Service (NTIS). NTIS is the principle repository and disseminating agency for all reports issued in conjunction with federal research and development activities. To order reports from NTIS, use the order numbers ("PB" numbers) listed after each report citation in the chapter bibliographies. The lack of an order number following the citation means that the report had not yet been entered into the NTIS system when this publication went to press.

Inquiries about the availability or price of reports should be addressed to NTIS, not to UMTA. The NTIS Order Desk telephone number is (703) 557-4650. Copies of the form used for ordering NTIS documents are reproduced at the back of this document. Photocopies of the form may be used for ordering reports. Payment must accompany orders. Prices vary in proportion to the size of the document and may be ascertained by phoning NTIS at the telephone number listed above. Most reports in NTIS are also available on microfiche. Microfiche copies have a uniform price of \$3.00 per volume for orders sent within the United States and \$4.50 for orders sent from abroad.

Payment for either standard or microfiche copies is acceptable in cash, by check, postal money order, GPO coupons, or American Express. Postage stamps are not valid as payment. It is possible to establish an account at NTIS, from which payments are withdrawn when documents are ordered.

The NTIS purchase price includes postage at the fourth class rate. Three to five weeks must be allowed for delivery. Much faster

delivery is provided by the NTIS telephone Rush Order Service, (703) 557-4700, for an additional charge of \$10.00 per document if mailed or \$6.00 if picked up at NTIS offices in Springfield, Va., or downtown Washington, D.C.

UMTA Abstracts

UMTA publishes an annual guide to its research reports entitled *Urban Mass Transportation Abstracts*. These volumes contain abstracts of reports sponsored by UMTA which are available from NTIS. Each volume is indexed by author, title, project number, and subject. The abstracts are of reports done under UMTA research, development and demonstration grants, technical studies grants, and university research and training grants. The following volumes are available from NTIS: Volume I, October 1972, PB 213-212; Volume II, September 1973, PB 225-368/AS; Volume III, July 1976, PB 264-905/AS; Volume IV, December 1977, PB 277-290/AS.

The Transit Research Information Center

Another repository for UMTA reports is the Transit Research Information Center (TRIC) which operates within UMTA's Office of Planning, Management and Demonstrations. TRIC maintains a full collection of all UMTA-sponsored reports. Although TRIC does not stock copies of reports for distribution, it will provide, upon request, a one-page technical abstract of any report. It is also possible to request abstracts of all UMTA reports related to a specific topic. TRIC publishes and distributes monthly abstracts of new UMTA reports. Anyone wishing to receive these abstracts on a regular basis should address a request to:

UMTA
Office of Transportation Management
Transit Research Information Center
400 Seventh Street, SW
Room 6432
Washington, D.C. 20590

UMTA's Public Information Service

UMTA conducts an active public information program through its Office of Public Affairs. Announcements are made of important project milestones, usually through press releases. Anyone wishing to receive such press releases should write to the Office of Public Affairs. The office also publishes a number of brochures, available upon request, describing various UMTA programs and policies.

UMTA's activities are also reported regularly in a magazine published by the Department of Transportation and entitled *Transportation USA*. This magazine is available through the Superintendent of Documents.

Congressional Hearings

Each year UMTA, like all other federal agencies, appears before the Senate and House Appropriations Committees to request funds for the following fiscal year.

An abundance of factual and statistical data concerning UMTA's present program, and plans for the future are submitted. Committee members elicit additional information through questioning. The entire transcript, constituting a comprehensive record of UMTA's activities, is published and may be obtained by writing to the two committees: Subcommittee on Transportation, Committee on Appropriations, United States Senate, Washington, D.C. 20510; and Subcommittee on Transportation, Committee on Appropriations, United States House of Representatives, Washington, D.C. 20515.

The Department of Transportation [DOT] Library

DOT's library began operation in 1969 when the libraries of the Bureau of Public Roads, the Coast Guard and the Federal Aviation Administration were consolidated. The Bureau of Public Roads' library had extensive materials on urban mass transportation and the collection has been substantially enriched since it was taken over

by DOT. The library maintains all reports produced by UMTA's R&D program and contains approximately 500,000 volumes and pamphlets and 170 drawers of vertical file material. The library receives more than 1,500 periodical titles. Most materials are available for interlibrary loan.

UMTA Files

In conformance with the Freedom of Information Act, UMTA has established within the Office of Public Affairs a document inspection facility. This facility is open to the public during regular working hours. The following records are available for inspection at the facility:

- Any final opinions and orders made in the adjudication of cases and issued within the administration;
- Any policy or interpretation issued within the administration, if that policy or interpretation can reasonably be expected to have precedential value in any case involving a member of the public;
- Any administrative staff manual or instruction to the staff which affects any member of the public;
- An index to the material described above.

Any person desiring to inspect such a record or to obtain a copy must submit a written request, specifying the record, to the Director of Public Affairs, Rm. 9330, Urban Mass Transportation Administration, Nassif Building, 400 Seventh Street, SW, Washington, D.C. 20590. Each request for a copy must be accompanied by the appropriate fee. Prices for various kinds of copies are given in 49 C.F.R., Part 7, Section 7.95. Photocopies are 25 cents for the first page and 5 cents for each additional page. The fees prescribed may be paid by check, draft or postal money order, payable to the Treasurer of the United States.

Any person to whom a record is not made available within a reasonable time after submission of a written request, or any person

who has been notified that a record he has requested cannot be disclosed, may apply in writing to the Administrator, Urban Mass Transportation Administration, for reconsideration of the request. The decision of the Administrator is final.

Correspondence with UMTA

UMTA is responsive to letters of inquiry. Letters addressed to the Administrator will be routed to the appropriate offices for reply.

UMTA headquarters and most offices are located in the Nassif Building at 400 Seventh Street, SW, Washington, D.C. 20590. The Office of Civil Rights, the Office of Technology Development and Deployment, two divisions of the Office of Administration and two divisions of the Office of Planning, Management and Demonstrations are located in the Transpoint Building, 2100 Second Street, SW, Washington, D.C. 20590. The Office of the Secretary of Transportation and the DOT library are located in the Nassif Building.

APPENDIX B

Urban Mass Transportation Grants and Contracts: Application and Procurement Procedure

Introduction

The Department of Transportation issues a publication entitled *Contracting with the Department of Transportation* (DOT P 4200.1) which provides information intended for organizations desiring to do business with the government.

The document is available free of charge from the Procurement Operations Division (M-43), Office of the Secretary, Department of Transportation, 400 Seventh Street, SW, Washington, D.C. 20590. While neither the pamphlet nor this appendix is a substitute for the official rules and regulations governing procurement, they should provide useful background information and serve as initial guides in a somewhat complex field.

Methods of Funding

Most of UMTA's research and development is performed by organizations equipped with expert staff and appropriate instruments and tools. If the organization is another federal agency, its services are paid for by the interagency transfer of funds. If it is a public body (e.g., a city, a public or private university, or a nonprofit institution), the funding is usually provided under a grant contract. To engage the services of private industry or commercial establishments, UMTA enters into procurement contracts in accordance with federal procurement regulations.

Grants

The award of grants is essentially a two-step process involving the Administrator's approval of the project and the amount of the grant deemed necessary to accomplish it, followed by the execution of a grant agreement which becomes the basic document describing

the mutual obligations of the government and the grantee with respect to the project. Interagency transfer of funds involves only the Administrator's approval and the execution of an interagency working agreement. These methods of funding are relatively uncomplicated; the project work can begin, with assurance of funding, as soon as the grantee or other agency is notified of the approval.

Contract Procurement

The contract procurement process is more complex, since it is circumscribed by an extensive body of federal contract law, federal procurement regulations, decisions of the Comptroller General, and numerous court decisions. The purpose of these regulations and rulings is to ensure that the basic principle of fair and open competition for government contract work is maintained. Since UMTA's R&D program has increasingly emphasized new and improved technology, it has tended to look mostly to private industry for its project procurement work and to rely heavily on the contract method.

Procurements for the federal government are accomplished either by formal advertising or by negotiation. Most UMTA procurements for R&D programs use negotiation. The negotiation process involves a Request for Proposals (RFP), designed to generate competition that will obtain industry's best efforts toward achieving UMTA's objectives. Each UMTA RFP is also designed to enable potential suppliers to compete on an equal basis; each includes such items as scope of work, delivery schedules, types of contracts, closing date, technical evaluation factors, and expected terms and conditions.

RFP's and Bidders' Mailing List

RFP's estimated at \$5,000 or more are synopsisized in the *Commerce Business Daily*. In addition UMTA's Procurement office notifies by mail a large number of businesses on its Bidders' Mailing List when an RFP involving the

specialties of these firms has been issued. Any company or individual may be placed on the Bidders' List upon request. Copies of the application form for the Bidders' Mailing List are available at all government procurement offices, and a copy is attached to the DOT pamphlet, *Contracting with the Department of Transportation*. The completed form should be mailed to Program and Operational Support Division (UAD-72), Urban Mass Transportation Administration, Department of Transportation, 2100 Second Street, SW, Washington, D.C. 20590.

No one whose address is on the Bidders' List, however, should feel assured of receiving notification of all RFP's that may be of interest to him. Notifications are made selectively to firms which have claimed special skills or resources closely related to the topics covered by the RFP, and there is much latitude in the interpretation of nomenclature of the thousands of specializations that may be involved in various R&D projects directed toward the problems of urban mass transportation.

Unsolicited Proposals

UMTA's R&D program has been formulated after several years of study and experience. It is the product of a thorough planning process which continually updates and refines the programs. Each project is part of a unified program which is translated into a budget, months prior to the execution of any project.

For these reasons, the lead time between the birth of a concept and the initiation of project implementation is lengthy. It is, therefore, improbable that even a highly competent and very promising unsolicited proposal would fit immediately into UMTA's R&D program or that there would be uncommitted funds to finance it.

The above statement of impediments in the proposal-to-project path are not intended to discourage serious and well qualified

applicants. On the contrary, every proposal will be reviewed and responded to as promptly as possible. It must be recognized, however, that budgetary and program constraints make it necessary to select for further consideration only the most promising projects which appear to be soundly conceived and most relevant to the needs of the budgeted program. Proposals selected for further consideration will usually require substantial documentation as the basis for detailed review including, as appropriate, a comprehensive analysis of engineering and economical implications.

UMTA's Evaluation of Proposals

The primary criteria employed in evaluating proposed R&D projects (both solicited and unsolicited) are:

- Potential contribution to R&D program plan and objectives;
- Potential for wide national application;
- Extent of the potential information to be developed;
- Degree of innovation incorporated; and
- Potential for eventual funding support by UMTA's Capital Assistance Program.

UMTA has drawn up a set of guidelines for the content and format of applications. These will be mailed, on request, to potential applicants.

Subcontracting

Another possible means of participating in UMTA's procurements is by subcontracting. In many instances, an UMTA prime contractor wishes to use another firm for professional services, construction or equipment. Thus, if a firm considered itself well qualified to perform one aspect or part of a project for which another firm has been chosen, the first mentioned firm could approach the prime contractor and offer its goods or services on a subcontract basis.

The Commerce Business Daily is a source of information about contract awards. These

are published, for the most part, for the benefit of potential subcontractors.

Cost Sharing

In some cases when a grant or procurement contract is awarded, financial participation by the performing organization may be required. This is intended to serve the mutual interests of the federal government and the performing organization by helping to assure efficient utilization of the resources available for the conduct of research projects and by promoting sound planning and prudent fiscal policies by the performing organizations. The requirement for cost sharing is determined on an individual project basis. The proportion of federal funding support to be supplied to an authorized R&D project is determined by the Administrator of the Urban Mass Transportation Administration.

University Research and Training [URT] Grants

University Research and Training (URT) Grants are made to public and private nonprofit institutions of higher learning performing research and offering training in urban transportation fields, such as economics, social sciences, engineering, physical sciences, law, public administration, and urban or metropolitan planning.

URT Proposals

In the late summer UMTA normally issues an announcement in the *Commerce Business Daily* inviting submittal of grant proposals. This announcement will provide any specific or yearly policy guidance necessary. It will also provide a deadline submittal date.

A formal proposal must be submitted outlining in detail the proposed research or training program, as well as a detailed delineation of the organization, staff, faculty, and budget. When necessary, UMTA personnel can provide informal assistance in interpreting the guidelines and preparing the formal application. UMTA prepares each year an announcement brochure and also has a

circular (C4900.1), "Application Instructions for University Research and Training Program," both of which can be requested from UMTA. They include a suggested format and detailed instructions for preparing an application.

Proposals should be submitted to Department of Transportation, Urban Mass Transportation Administration, University Research and Training Division, 400 Seventh Street, SW, Washington, D.C. 20590.

Evaluation of URT Proposals

Proposals submitted to UMTA will be reviewed and evaluated by persons selected from within the Department of Transportation. It is essential that proposals be complete and organized according to the specified format as set forth in the above-mentioned brochure to permit equitable evaluation. Each proposal will be reviewed as an entity, but elements of the budget may be negotiated with the applicant. Thus, amounts less than those requested may be approved.

UMTA will use the following factors when deciding on grant awards:

- Relevance of the program to urban transportation;
- Merits of the scientific and technological aspects of the research program and research methodology;
- Compatibility of the program with the institution's and DOT's goals of meeting future manpower requirements in urban mass transportation;
- Quality of the performing staff;
- Consistency of budget estimates with the type and level of the proposed work;
- Geographical location of the applicant institution (an effort will be made to encourage the establishment of research and training programs throughout the country to ensure broad relevance to metropolitan problems);
- Extent to which opportunities are provided for participation of minority groups and colleges and universities

serving minority groups;

- Degree of involvement with local urban transportation problems; and
- Extent to which the institution is willing to share the costs of the project.

A proposal that does not result in a grant may be retained by UMTA. However, it will not be made available outside UMTA without the consent of those who signed the proposal or their successors in office, except to the extent that disclosure thereof may be required by a court of competent jurisdiction. Proposals may be withdrawn by the applicant at any time prior to final action by UMTA.

Additional information may be obtained by calling (202) 426-0080.

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